

REVIEW of EDUCATIONAL RESEARCH

VOLUME 12
1942

REVIEW of EDUCATIONAL RESEARCH

VOLUME XII
1942

AMS REPRINT COMPANY
New York 3, N Y.

Reprinted 1964
WITH THE PERMISSION
OF THE ORIGINAL PUBLISHER

AMS REPRINT COMPANY
New York, N. Y. 10003

Printed in U.S.A

Pupil Personnel, Guidance, and Counseling

Reviews the literature from October 1, 1938 to October 1, 1941. Earlier literature was reviewed in Vol. IX, No. 2; Vol. VI, No. 2; Vol. III, No. 3.

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INTRODUCTION

LIKE THE PRECEDING ISSUES devoted to pupil personnel, guidance, and counseling, this issue at the outset focuses attention on the recipient of the service—the student in elementary school, secondary school, and higher education. It seems logical to consider next certain conditions that make effective guidance possible—emotional atmosphere of the school; policies and practices with respect to attendance, promotions, pupil personnel records and reports; and the role of evaluation in improving conditions and procedures. The next two chapters deal with the two major processes of personnel work—counseling and work with groups. The fifth chapter deals with the more specialized aspect of information about educational and vocational opportunities, and the sixth with a review of guidance programs as a whole. The last chapter reviews references on the preparation of teachers and specialists, upon which the future success of personnel work largely depends.

In a sense this issue is experimental insofar as the contributors were free to introduce in their chapters certain innovations in form and treatment. Although several chapters conform to the traditional pattern of brief mention of a large number of references, others have selected a relatively small number of references for as intensive a treatment as space permits and have introduced a certain amount of orientation, interpretation, generalization, and application of the factual material to practical guidance problems. Ideally, each chapter should be written by a person who has become so saturated with the research in his area that the most significant references spontaneously come to his mind and he feels free not only to present the main facts but also to discuss their implications.

RUTH STRANG, *Chairman,*
Committee on Pupil Personnel, Guidance, and Counseling.

CHAPTER I

The Students—Their Characteristics and Needs¹

H. H. BIXLER, ETHEL L. CORNELL, ROBERT J. HAVIGHURST, and
CLARENCE LINTON

Elementary School²

PREVIOUS REVIEWS of this topic in the REVIEW OF EDUCATIONAL RESEARCH for April 1936 and April 1939 treated ability, achievement, personality, and problem behavior. Trends in recent research have been toward (a) emphasizing a developmental approach to the characteristics of children and their needs in school; (b) increasing attention to the interrelations of external factors with various aspects of growth; (c) clarifying fundamental differences in philosophy in the attempt to define curriculum needs; and (d) developing new technics for studying social behavior.

Developmental Studies

As further data are accumulated in growth studies, the evidence more clearly supports the hypothesis that each individual has his unique pattern of growth. Growth curves based on numbers of individuals measured over a period of years have shown certain stable characteristics, but individual curves have fluctuated widely. Gesell (37) came to the conclusion that this apparent random fluctuation really represented an ordered variability. He found (38, 39) that individual growth was closely predictable, even in infancy, if prediction was based on adequate clinical study and not merely on quantitative test scores. Bayley (8) found, however, as other investigators have, that the predictive value of mental tests or IQ's below the age of four years is practically zero. This she ascribed to the extreme rapidity of growth and the small variability of scores below the age of two or three years.

Other major growth studies, in addition to those summarized in the April 1939 issue of the REVIEW, have been carried on with young children at Berkeley, California (56), at Somerville, Massachusetts (17), and at the Institute of Child Welfare, University of California (70). The last mentioned study corroborated others in showing that girls were physiologically more mature than boys at all ages and that at the level of the seventh or eighth grade, about two-thirds of the girls had reached puberty while two-thirds of the boys had not. Different rates of prepubertal growth acceleration caused those who developed slowly to lose prestige but did not necessarily affect emotional adjustment if immediate friends

¹ Bibliography for this chapter begins on page 16.

² This section was written by Ethel L. Cornell.

kept a similar pace. This suggests the importance of social maturity as a factor in making adaptations to the needs of pupils at the prepubertal stage. A summary of the principles of growth supported by research was given by Bell (10). See also summaries in the December 1941 REVIEW OF EDUCATIONAL RESEARCH.

Illustrative of genetic studies of special aspects of growth related to the school curriculum is a study of the growth of perceptual habits in spelling by Gilbert (40). He made eye-movement records of the same pupils in learning to spell certain words in Grades IV, V, and VI. In general, the number of fixations per word and the number of regressions decreased from year to year, but the average time per fixation remained about the same. Increasing maturity was shown in greater recognition of what correct spelling involves as well as in improvement in mechanics. Millard (74) made a study of growth in reading before puberty, using the isochronic equations developed by Courtis, and checking prediction by measurement of the same pupils (55 boys and 62 girls) over a six-year interval (not less than three years for any individual). He found that growth in reading from age seven to age eleven closely approximated a regular curvilinear development, not comparable with the straight-line norms of the test, and that the actual achievement of these pupils was closely predicted by the isochronic equation. The implication Millard drew was that teaching within the usual curriculum pattern does not change the actual achievement from the predicted in any marked way and that excessive teaching can bring only superficial results.

Thus, both Gesell plotting growth curves on logarithmic charts and Millard using isochronic equations found their predictions to be valid for individual cases. Perhaps the reason for some of the apparent fluctuations reported by other investigators may lie in inadequate bases for prediction.

Influence of Nature and Nurture

Investigations at the University of Iowa Child Welfare Research Station, previously reported in the REVIEW of April 1939, suggested that changes in educational and social conditions might alter the rate of mental growth. Criticisms of the Iowa studies led to a re-exploration of the nature-nurture problem (78). Bayley (7, 8) studied the relation of health, physical size, body proportions, skeletal maturity, socio-economic factors, nursery-school attendance, family constellation, and observed emotional factors to rate of mental growth from the age of one month to eight years. She was unable to find any consistent relationship between any of these factors and fluctuations in mental growth, and concluded that growth in intelligence is due primarily to tendencies within the developing organism, and that individual fluctuations are the effects of changes in mental organization concurring with maturation.

One of the primary research needs for growth studies is an adequate unselected sampling of children of different ages, such as the Scottish

sampling of children aged nine to twelve on Stanford-Binet and performance tests (67). Comparable studies for American areas are greatly needed. Conrad and Jones (22) provided some normative data for a study of familial resemblances, using the somewhat homogeneous rural populations of Vermont and New Hampshire. They applied tests of "logical consequences" to various hypotheses concerning the importance of nature and nurture. They found that the facts were not fully accounted for either by any of the environmental hypotheses or by the current alternative genetic hypotheses of blending or of complete dominance. The evidence from the *Thirty-Eighth Yearbook* (78) indicated rather less influence of environmental factors on mental growth than may have been generally anticipated. Data are still too fragmentary to lead to unequivocal interpretations. Such interpretations as are made, therefore, continue to reflect one's fundamental philosophy.

Curriculum Needs

The cleavage in fundamental points of view on curriculum needs for elementary schools was well expressed by Melby (71), who challenged the assumption that there is "a body of subject matter, the learning of which constitutes an education" (71: 439). He also asserted his conviction that education is creative living whose goal is "well-rounded growth and development of children, teachers, and parents" (71: 440).

There is a trend away from the analysis of curriculum content to a study of the developmental process, and the consideration of optimum times at which to begin specific instruction. However, as Brueckner pointed out, "the fact that a particular skill . . . can be learned at a given level of development is not, in itself, a valid reason for teaching it at that level unless the evidence shows at the same time that the item meets some vital need of the learner" (15: 363). Attempts to relate the curriculum more definitely to areas of living have been made by Frederick (34), Worlton (113), Seay and Clark (89), and on a statewide basis in Virginia (54). Evidence that the so-called tools can be acquired incidentally by pupils while engaged in purposeful lifelike activity was collected by Meriam (73).

A profitable type of research to complement the effort to create lifelike situations for children is that dealing with the development of children's concepts. Wasson (108) attacked this problem in kindergarten and first and second grades, in the area of understanding of home and family relations. This type of study seems to have excellent possibilities for revealing pupils' basic intellectual needs. Other studies of the growth of concept formation in children have been made by Welch (110, 111), Thompson (101), and Lord (63). A general critical review of the whole field of child development was made by Stoddard (94), and specific phases were treated in the December 1941 issue of the *REVIEW*.

Social Behavior

One trend in this area is toward devising technics for more objective analysis of observed behavior in situations which are experimentally constructed. Nursery-school experiments on aggressive behavior were continued with kindergarten children by Anderson (4). A careful observational study of changes in aggressive behavior in a limited number of nursery-school children during eighteen months was made by Fite (30), who concluded that the only technic of the teacher which appeared to fulfil the child's needs and to provide for real development in emotional control was that of helping the child to find a solution to his immediate problem without openly implying any reproof or changing the direction of his activity.

The influence of various components of the group situation on individual development will be described in more detail in Chapter IV, "Guidance through Groups." Northway (81) made suggestions for the adaptation of Moreno's measurement of group constellations in elementary-school groups. Zeleny (117) employed a similar technic in the study of individual and group morale and found that the method had a high reliability and that an increase in morale could be effected by shifting group membership.

The general area of personality study and adjustment was reviewed in the December 1940 issue of the REVIEW, in which Stevenson pointed out areas in which the complexities of modern life create conflicts and contradictions which interfere with growth, and described the essence of education as the occurrence of "inspired moments when two personalities come together with mutual growth" (93: 409). The research which seems to the reviewer to have the most important implications for elementary guidance can be summarized under two headings:

1. Accumulating evidence that individual growth follows a pattern which can be discovered if we have sufficient knowledge and adequate technics, but that a generalized pattern for all individuals, as implied by grade standards, is a very inadequate guide for individual development.
2. Accumulating evidence that intragroup relationships are a dynamic influence in the learning process, and that class and school groups might be made far more effective than they usually are in fostering desirable habits and attitudes and the integration of personality.

Secondary School ³

The rapidly growing body of research on adolescent development has been reported in the REVIEW OF EDUCATIONAL RESEARCH for December 1941. Some of this research bears directly upon the practice of education, while other parts of it are related more closely to the practice of medicine, to social work, or to other services for youth which the secondary school does not provide. The purpose of this review is to report studies which

³ This section was written by Robert J. Havighurst.

have a rather direct bearing on problems of curriculum and of guidance in the secondary school.

The past three years have been notable for the large number of surveys of youth completed and reported (3, 14, 27, 65, 66) and for publications from several longitudinal studies of adolescence. The California Study of Adolescents, in which a group of 200 boys and girls were studied for eight years, from the time they were ten years of age until they graduated from high school, has been completed and its results are now appearing in a stream of publications. Another volume has appeared reporting results of the Harvard Growth Study (26). Short case studies of individual high-school students have been published by Zachry (115) and by Stolz (95). No doubt there will be more publications in case-study form of the facts of adolescent development.

The surveys of youth combine with the longitudinal studies and the individual case studies to present a picture of the life of young people as consisting of certain "developmental tasks." Zachry (116) and Bloss (11), in particular, have given currency to this way of thinking. It is argued that the secondary school, as a school designed to help meet the needs of every kind of boy and girl, should help them to achieve their "developmental tasks." Accordingly, the research studies which throw light on the nature of these tasks have been collected in this section under the following headings: "Adjustment to a Changing Body"; "Adjustment to Age-Mates of Both Sexes"; "Achieving Adult Economic and Social Status"; "Development of the Self."

Adjustment to a Changing Body

Physical growth and development during adolescence are seen much more clearly as a result of longitudinal studies of adolescents (6, 29). The California data on the growth of adolescent boys have been summarized by Meek (69). The general curve of velocity of growth among boys exhibits a "cycle of puberty" which has a duration of 4.2 to 7.5 years, begins at age 9.7 to 13.5, and ends at age 14.7 to 18.5. The pattern of growth is roughly similar for all boys, but there is a great variation in the duration and the times of beginning and ending of the "cycle of puberty." Girls show a similar pattern, but are advanced, on the average, about a year over boys. Stone and Barker (97) found that post-menarcheal girls differed significantly from pre-menarcheal girls of the same age in showing more heterosexual interest, more interest in adornment or in display of person, and less interest in active games. Reymert (84) found no relation between age at menarche and problem behavior, or between age at menarche and intelligence, among girls in a large orphanage. Letters sent by boys to the editor of a department called "Keeping Physically Fit" in a boys' magazine indicated that boys who are undersized or are late in maturing sexually tend to become worried about their "normality" during adolescence (24).

Adjustment to Age-Mates of Both Sexes

Recent research on the social behavior of adolescents has shown that the "peer culture" or the accepted ways of the adolescent age-group are important in shaping the attitudes and interests of boys and girls (18, 35, 70, 87). The school has been studied by the California group as a laboratory for social experimentation by boys and girls (96). Tryon (106) has found, through use of the "Guess-Who" technic, that boys and girls aged twelve attribute one set of qualities to those who are most popular, while the same boys and girls at age fifteen select a somewhat different group of their age-mates as the most popular and attribute somewhat different qualities to them.

Achieving Adult Economic and Social Status

Getting a job or becoming prepared for an occupation is the chief concern of high-school students, according to a study by Symonds (100), the results of which represent those of numerous other studies made during the past decade. A great deal of research on the economic status of youth has been summarized by staff members of the American Youth Commission (9, 64) and presented with the results of experiments on the occupational guidance and placement of youth. Recent studies have continued to show that most high-school students aim at occupational goals higher than those achieved by their fathers (27) and also that many more young people wish to enter the white-collar occupations than can possibly find places there (16). Super and Wright (99), comparing high-school graduates of 1928-29 with graduates of 1933 and 1935, found that those who graduated during the depression were less likely to aim above their fathers' occupational level. The volunteer work-camp movement for high-school youth has been studied and approved by the American Youth Commission (53). Carter, Taylor, and Canning (19), in a study of the use of the Strong Interest Inventory with high-school students in the tenth, eleventh, and twelfth grades, indicated that this Inventory is probably valid and reliable for boys and girls in the eleventh and twelfth grades. A study of attitudes made by Rosander (85) in the Maryland Youth Survey showed that certain social attitudes which are closely related to behavior choices which young people have to make change with age from sixteen to twenty-four. For example, attitudes toward drinking and church attendance show such a change. But "verbal" attitudes, such as attitudes on government policy, child labor, and sex education, do not change with age from sixteen to twenty-four.

Development of the Self

The crowning task of the adolescent is to achieve a mature personality, realistically adjusted to the demands of getting along with people, of making a living, and of raising a family. This requires a consistent set

of values and ideas about the nature of the world and of man which are in accord with those values. Zachry (116), Bloss (11), and Lloyd (61) have stressed this point of view as a generalization based partly on the results of the Progressive Education Association Study of Adolescents and partly on their own beliefs concerning the desirable course of human development.

Socio-Economic Status and Education

Growing emphasis has been placed by research workers on investigation of the relations between socio-economic status and educational opportunity and achievement. Rosander (86) summarized the results of several youth studies with the conclusion that economic stratification of youth due to fathers' occupations limits the educational opportunity of many young people. But he found that boys with unskilled fathers frequently hold semiskilled or skilled jobs. Hand (47) found that the cash cost of attending a city high school and participating in its ordinary student activities is so high as to discourage participation by youth from the lower income groups. Parental income is closely related to college attendance and to choice of college course, according to a study of Milwaukee high-school graduates by Goetsch (42). The courses followed by students, in order of descending parental income, are law, medicine and dentistry, liberal arts, journalism, engineering, education, commerce, nursing, industrial trades. School achievement was found by Coleman (21) and behavior was found by Springer (91, 92) to be superior for junior high-school students of superior socio-economic status.

Studies of Negro Youth

The American Youth Commission has sponsored a series of studies to find out how the personalities of Negro youth are affected by their minority-race status (25, 33, 55, 83, 107). The various authors agreed in finding that the low social and economic status of the Negro produces a poor environment, which in turn produces unfavorable personality traits in Negro boys and girls. Thus the formation and development of personality in Negroes are dependent on factors within the structure of Negro society, which in turn are influenced by the relation of Negroes as a group to white people as a group.

Mental Abilities and Reading Interests

Research on primary mental abilities has been extended from college students to high-school students, and Thelma Thurstone (102) reported that six primary factors have been found with sufficient stability to justify their use in practical test work in the junior and senior high school. These are Verbal Comprehension, V; Word Fluency, W; Number, N; Space, S; Rote Memory, M; and Induction or Reasoning, R. Correlation

between these factors is higher for high-school students than for adults. Odom (82), studying the results of achievement tests, found evidence that students' performance in the academic subjects can be predicted fairly well from test results in the tenth grade. He also found that English and foreign language scores were highly correlated, as were mathematics and science scores, thus suggesting a difference between linguistic and mathematical abilities which can be used for guidance purposes as early as the tenth grade. Studies of reading interests have been summarized by Gray (45). Brink (13) and La Brant and Heller (60, 50) have studied the change of reading interests with age of high-school students. The latter authors found a decline in the reading of narrative and a gradual development of interest in other forms of literature.

Higher Education ⁴

The growing emphasis on the study of the whole student in relation to his physical and social environment noted in 1938 has accelerated. The following review is limited to philosophical, survey, and research studies which indicate emphases and trends. Indispensable to the research worker in this area is an annotated bibliography of 2,500 titles on American youth by Menefee and Chambers (72).

Physical Characteristics

Research on physical characteristics, maturation, health, and physical disabilities in relation to the achievement and adjustment of students is extremely limited and fragmentary. Such studies as have been reported indicate that (a) about 19 percent of college men at the University of Illinois probably do not qualify for general military service (12); (b) college students at the University of Michigan are younger, taller, heavier, and have a better muscular development than in 1900 (52); (c) students have not reached skeletal maturity at entrance to college (31); (d) the incidence of physical defects in a sampling of students in a limited group of institutions is nearly 60 percent for dental defects and over 35 percent for nasal obstruction; and (e) health information and services are inadequate in most institutions (49).

Mental Ability and Achievement

The tendency to broaden the objectives and scope of research on abilities and achievement is indicated by the diminishing number of atomistic studies, by the increasing questioning of and dissatisfaction with the necessary expenditure of time and effort in the use of the multiple correlation technic, and by the increasing number of significant attempts to take cognizance of the complex relationship among background factors, personality traits, and behavior patterns. May (68) has made a critical

⁴ This section was written by Clarence Linton.

summary of research in this area and Heaton (48) has reviewed the contributions of research to the redefinition of entrance requirements. Three studies have special significance. The first is the report by Aikin (1) on the results of the Eight-Year Study of the Progressive Education Association. The second was made by Hale and others (46) in their study of the transition experience of college students. The third is a comprehensive study of failure made by Heaton and Weedon (49) which suggested that college instructors oversimplify the problem of failure, especially in relation to motivation and emotional factors. Traxler (105) has shown that ability to do successful college work must be viewed in relation to the abilities represented in the student population and the standards of the particular institution. Ryans (88) found that students are able to predict their scores in advance on the National College Sophomore Tests. Reports on several studies of reading abilities and the results of remedial technics have indicated that many college students need assistance and that they can greatly increase reading efficiency in both speed and comprehension, but more in the former than the latter. Anderson and Dearborn (5) found reading ability and achievement positively related independently of intelligence.

Beliefs and Attitudes

Much of the research on the beliefs, attitudes, opinions, and morale of college students is inconclusive. Murphy and Likert (76) made a study of student attitudes on public questions in seven colleges and universities followed by a retest five years later. The authors suggest that the next steps in attitude research should be through diaries, interviews, and biographical data. Other studies indicated that there is relatively little change in attitudes and beliefs during college, but that this change is in the direction of greater liberalism. Katz and Cantril (57) found that Princeton students accept Communist ideas more favorably than Fascist ideas, reject both labels, and that the Communist label carries more stigma. Ability to define communism and fascism appears to have little effect on attitudes. Edgerton (28) found women more liberal and consistent than men, a larger negative relationship between uncertainty and liberalism than between uncertainty and conservatism, suggesting that those who hold liberal views develop an emotional condition to support their opinions. Nelson (80) reported that there is a positive relationship between the vocational choices of students at the University of Nebraska and their attitudes. Those who have chosen banking, dentistry, music, and governmental service are more conservative than those who have chosen journalism, social work, law, and agriculture. Men and women from denominational colleges are more favorable to marriage than students in the University of Iowa. There is a trend toward a growing indifference to sex purity, a lifting of the taboos among women on sex attraction, a decline of religious interest, and an expressed desire for

fewer children among college and university students (79). An extensive sampling of college graduates shows that about 84 percent of the men and 46 percent of the women forty years of age or over are married. The average size of families of the men is 3.22 and of the women 3.13 as compared with 4.05 for the total population (103). Miller (75) found the following six factors positively related to the morale of college-trained adults: age, size of income, occupation, regularity of income, stability of employment, and hours worked per week. He suggests that it is possible to predict morale if the major factors associated with morale can be identified.

Personality

Watson (109) has critically reviewed the research on personality adjustment and suggested desirable emphases and directions. Zachry (116) and Blois (11) have provided a wealth of case material on adolescent behavior from the Progressive Education Association Study of the Adolescent. Lloyd-Jones (61a) has prepared a brochure on social competence and college students.

In his study of the transition experience of college students, Hale (46) identified and defined four behavior patterns which characterize the successful personality and largely determine college success: (a) a purpose pattern; (b) a social pattern; (c) a decision pattern; and (d) a sensitivity pattern. These patterns are defined as groups of interrelated habits developed in previous experience which predispose the individual to act in characteristic ways. Many other studies noted in this review and particularly those of Blois (11), Heaton and Weedon (49), Miller (75), Murphy and Likert (76), Wrenn and Crandall (114), and Zachry (116) support Hale's findings in general if not in specific patterns.

Vocational Interests and Choices

Three noteworthy contributions to the research literature in this area have been made during the past three years. Cowley, Hoppock, and Williamson (23) have provided an authoritative brochure on the need for and the principles of occupational orientation of college students, Bell (9) has studied the occupational adjustment of youth, and Larwin (64) has surveyed youth work programs.

Several studies have been focused on the occupational attitudes, aims, and choices of students. The findings of these studies emphasize the need for education for work as one of the central aspects of general education and the necessity for vocational guidance at the college level. Sisson (90) found that urban or rural residence is an important factor in conditioning vocational choice and that vocational choices of rural freshmen at the time of admission seem somewhat less stable than the choices of urban freshmen. A study of the U. S. College Graduate by Time, Inc. (103)

provided data on the employment, occupations, and income of college graduates in relation to the total population, indicating that over 60 percent of the men and over 80 percent of the women enter the professions or governmental service and that their incomes average over twice as high as those of the total population.

Problems

Three significant studies of education for family life (2, 32, 43) indicated the growing awareness of the problems of adjustment arising from family life and the necessity of more effective sex education and preparation for marriage. Lloyd-Jones and Fedder (62) have prepared an authoritative book on the social problems, needs, and processes of social and emotional maturation of the young adult. Kirkendall (58) has made case studies of the sex adjustment of college men in one institution which indicates the need for group instruction and individual counseling. In an extensive study of high-school seniors in Ohio, Toops (104) found the following factors predictive of college going: (a) the geographical region of the home; (b) religion of the family; (c) education of parents; (d) occupation of father; (e) participation in extracurriculum activities in high school and honors thus received; and (f) intelligence of the individual. Goetsch (41) found that about three out of four high-school graduates in Milwaukee who did not go to college did not do so for lack of financial resources and that about half of those who did go to college expected to earn a part or all their expenses. In a study of freshmen at the State College of the University of North Carolina, Winston (112) found that over a four-year period four-fifths of all freshmen reported the necessity of earning a portion of their expenses, one-half expecting to earn at least one-half of their support. Super (98) reviewed the studies and literature on employment of college students and concluded that a thoroughly integrated plan of work and study would be advantageous to students from the point of view of vocational training and academic motivation, but that this appears to be impossible of realization.

Such studies provide convincing evidence that youth of college age are faced with many crucial economic, social, and personal problems which probably are given but slight consideration in the instruction which they receive. The factors affecting emotional adjustment and achievement in relation to the abilities, interests, and needs of college students appear to offer fruitful fields for further research. It should be emphasized that the need is for follow-up studies of drop-outs and graduates which take cognizance of motivation and behavior patterns.

These studies all contribute to the basic conclusions that abilities are complex and highly individualistic and that the most fruitful research will probably be in the longitudinal study of behavior patterns of the individual by means of a combination of records, tests, counseling, and evaluation—technics which enlist the interest and participation of the student himself.

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CHAPTER II

Conditions That Make Effective Guidance Possible¹

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Introduction

FEW TOPICS FOR RESEARCH IN EDUCATION are unrelated to the quest for improved methods of guidance. Hence, the content of this chapter has necessarily been selective, stressing those phases of the REVIEW cycle that have not been treated especially from the standpoint of improving the conditions necessary for effective guidance.

One of the essential needs of the school environment is an emotional climate that will support optimum growth and be conducive to effective guidance. With the possible exception of the child's parents, a classroom teacher has the greatest single opportunity to influence personality development and personal-social adjustment. Prescott (115) enumerated the factors that may account for an unwholesome emotional climate as a social tradition which results in a belief on the part of the public that the function of the schools is to bring children to a mastery of "subjects" of study, and in a conviction that the way to a rich life and to good citizenship is through progress in specific learnings; administrative practice resulting in an administrative hierarchy which determines the working conditions of teachers and thus influences the morale of schools; a teacher personality created by conditions which give a teacher neither security nor status, and which demand that a teacher value the academic accomplishment of boys and girls more highly than their personality development; and educational theory which has become merely a device for achieving the traditional objectives of factual and skill learning.

A sense of really "belonging" to a group is a psychological imperative in the creation of an atmosphere for effective, worthwhile learning; the hygienic classroom is one permeated by a spirit of camaraderie, friendliness, sympathetic concern, and genuine affection (166). Ryan (129) advised that such an atmosphere is within the reach of ordinary teachers and that it does not necessitate elaborate equipment. He held that it should include opportunity for the teacher to give each pupil a task commensurate with his nature and abilities and to provide wholesome social relations. From the teacher it demands maturity, social adjustment, good mental health, and an understanding of child and adolescent psychology. Ryan finds significant evidences of good mental health practice in some places, in others a serious discrepancy between what is done in school and what is conducive to good mental health. He makes this startling statement

¹ Bibliography for this chapter begins on page 37. Acknowledgment for assistance in the preparation of the bibliography is made to Elizabeth Cameron, William M. Duncan, and William Metzner.

which every teacher might well ponder: "Simple friendliness in the schoolroom would seem to be one of those easily obtainable and obviously desirable conditions for any human enterprise having to do with mental good health, but the visitor to schools finds it in shockingly few of the places he visits."

There is a scarcity of literature presenting comparative descriptions and educational results obtained in different school atmospheres. Lewin, Lippitt, and Escalona (94) found that the quality and quantity of the work done in the democratic atmosphere were superior. The autocratic leader found it necessary to assume more responsibility, while the democratic leader assumed less. When boys and girls were interviewed concerning their preference in social atmospheres, there was no hesitancy in the 95 percent choice for democracy. As a second choice, 70 percent preferred laissez-faire to autocracy. Democracy is, then, the psychological environment which best develops friendliness, cooperation, initiative, responsibility, and objective skills—it is that in which boys and girls are most likely to learn.

Recent reviews of research related to discipline are found in the REVIEW cycle (97, 151) dealing with the topics of drives and incentives; punishment; fears; adjustments and treatment; adolescence; mental hygiene and democratic principles; mental hygiene and education; child psychiatry; family background and child adjustment; home background and adjustment in school; providing school environment conducive to mental health; teachers' knowledge of mental hygiene; influence of mores and traditions; motion pictures, radio; problem children, delinquency and treatment; technics and instruments of mental hygiene diagnosis and therapy; pre-psychotic personality.

Strang (142) summarized research on discipline from the standpoint of (a) history of concepts of discipline as, period of compulsion, period of competition, period of development; (b) merging of "discipline" with child study, adjustment, guidance, individualization, and mental hygiene; (c) listing of scientific studies as follows: laboratory experimentation on effects of reward and punishment on learning and of success and failure on level of aspiration, studies of children's and parents' attitudes toward punishment, classroom experiments and demonstrations, clinical studies of disciplinary cases; and (d) evidence that the "newer" discipline works. In the *Encyclopedia of Educational Research* (101) pertinent research is reviewed under the topics: "Problem Children and Delinquency"; "Character Education"; "Effect of Environment on Personality and Social Behavior"; "Relationship between Body Type and Behavior"; "Growth of Moral Concepts and Conduct"; "Growth in the Emotions"; "Growth in Social Development"; "Disciplinary Procedures with Student Personnel in Colleges and Universities"; "Mental Hygiene Services"; "Juvenile Delinquency"; "Mental Hygiene"; "Classroom Motivation"; "Motivation"; "Personality"; "Philosophy of Education"; "Traits and Qualities Essential to Success in Teaching."

Specific attention is given in sections that follow to the problems of attendance, promotion, personnel records and reports, and evaluation, as phases of the problem of providing conditions that make guidance possible.

School Attendance ²

Research in previous trienniums (68) pointed to several tendencies in the field of school attendance. Among these tendencies were (a) a decline in elementary-school enrolment; (b) large increases in secondary-school enrolment; (c) increases in the regularity of attendance of children enrolled; (d) increased efforts to determine causes of nonattendance; (e) increasing recognition of the importance of causes for nonattendance other than illness; (f) increased attention given to home conditions, general social conditions, and the general adaptability of local schools to meet the needs of pupils as the real factors determining the regularity with which pupils attend school; (g) increased demands for trained attendance workers; and (h) an increased need to coordinate all school services that specialize in the study of pupils aimed at effecting their adjustment. Most of these tendencies continue to be noted, during the triennium covered by this review, in the volume of nonresearch articles dealing with attendance problems and by some of the reports on research; other reports of a research nature hark back to earlier theories.

Enrolment

The decrease in combined elementary- and secondary-school enrolment that appeared for the first time in the biennium of 1935-36 continued through both the following bienniums. The decreases for the more recent bienniums were markedly greater than the first decrease. These decreases in enrolment, however, failed to keep pace with the decreases in child population, ages five to seventeen inclusive; this is shown by the constant increase in the ratio of enrolment to child population, which rose 2.3 points during the 1939-40 biennium (52, 53).

Elementary enrolment definitely continued its decrease which began in 1931 with a drop of about 70,000; 1932 showed a similar decrease. The following four years—1933, 1934, 1935, and 1936—showed decreases of nearly 200,000 annually; the next four years showed decreases of about 350,000 annually (52, 53). These decreases have continued, therefore, at a somewhat accelerated pace.

The secondary-school enrolments, on the other hand, are still on the increase, but the rate of increase slowed down perceptibly during the years 1933-1938. The increases during the two latter years in this period were reduced to approximately 125,000 annually. The recent data for 1940, however, based upon fairly complete reports, indicate a slight upward surge again in secondary-school enrolments (52, 53).

² This section was written by Arch O. Heck and William R. Flesher.

Attendance

Average daily attendance in both elementary and secondary schools in the United States reached its peak in 1934 with the total of 22,458,190. Each biennium since has seen successive decreases, although the decrease of 1938 under 1936 was almost negligible. The decrease of 1940, based upon extensive sampling, indicates the greatest decrease for any biennium; the figure reaches almost a quarter of a million.

These decreases in average daily attendance, however, are less than the corresponding decreases in enrolment; this is shown by the fact that percentages of attendance continue on the increase. The percentages of attendance for the United States in 1940 reached the all time high of 86.1 (52, 53).

Factors Influencing School Attendance

Reports of research during the triennium 1939-1942 emphasize several factors that seem to be related to regularity of school attendance. Williams (163) brought distance to the fore, once again, as an important factor in attendance. In this respect, his report is the most significant since Reavis made his report on factors affecting rural-school attendance. Williams' approach to the problem is quite different from Reavis', however. Williams was particularly concerned with the extent to which elementary-school graduates attended and continued in high school, while Reavis was interested in the regularity of their attendance. Williams concluded that "the data indicate quite clearly that the distance children live from a high school is a factor in their starting to high school" (163:95). He found, however, that about the same number who started high school completed it regardless of distance; the percentage that completed the high-school course, after once getting started, was 74. Williams (163) also related the type of the school district to the holding power of the school. The general conclusion was in favor of the consolidated district over the rural- or the city-school district. Approximately 90 percent of elementary-school graduates in consolidated school districts entered high school and 75 percent graduated; for city districts these percents were 90 and 66; for rural districts they were 60 and 50.

From his study of regularity of school attendance, Calloway (22) concluded that "children having physical defects reported by the school doctor are absent more often than those not having defects," that "diseased children are absent longer periods of time than those ill occasionally," that "home conditions are controlling powers in school attendance and health," and that "an inverse relationship exists between socio-economic status, health, and school attendance."

Jelsma (77) concluded that "one of the most important influences on attendance is the compulsory attendance law that has been legally enacted in Oklahoma" (77:66). She says further that "of importance in the progress of school attendance was the more accurate scholastic census"

(77:67). Among other factors that she rates as of importance are (a) consolidation of rural schools, (b) improved certification procedures governing appointment of teachers, (c) better programs of study for pupils, and (d) the widespread development of specific vocational training.

Reniers (126) re-emphasized laxity in the development of procedures for enforcing attendance as an important cause of nonattendance. She particularly pointed out the laxity of teachers in keeping records of nonattendance and in reporting promptly all cases of nonattendance. She also cited the failure of attendance workers to invoke legal penalties upon children, employers, and parents as real causes of nonattendance.

Surveys of causes of nonattendance—Findings as to factors related to school attendance are perhaps the results of procedures followed. Most of these surveys represent mass-survey technics as opposed to case studies for determining why pupils are irregular at school or do not attend. They point to certain accompanying factors; they never make clear causal relationships.

Reniers (126), for example, studied thousands of excuses given by pupils and parents. She also sought by questionnaire an explanation from the pupils of reasons for absences. Another questionnaire, completed by teachers, indicated what they thought to be the chief factors affecting school attendance. Jelsma (77) used a historical approach. She assembled data on enrolment and attendance for each of the eight state school administrations in Oklahoma from 1907 to 1938; these data showed marked increases during this period. She, likewise, found that improvements had occurred in the attendance laws, the school census, teacher certification, and the like. She concluded that these factors were, therefore, related to attendance. Calloway (22) studied two large elementary schools at Atlanta, Georgia. One represented a very poor section of the city, the other a typical better class community. She found more absence and more sickness in the elementary school in the poor section of town. Williams' study (163) included 61 percent of all eighth-grade graduates in Iowa for 1932. These children represented 69 of Iowa's 99 counties.

Perhaps the greater need, from the point of view of procedures in determining causes of nonattendance, is continued emphasis on case studies. The relating of various factors to attendance by the survey technic has its value, but before any real attack on causes of nonattendance can take place, the attendance worker must know why William or Mary has been absent. The case-study technic might well be used by research workers during the immediate future in further attempts to unearth causes of nonattendance.

Means of Improving Attendance

These studies of school attendance (22, 77, 126, 163) suggest a variety of procedures that might improve attendance. Williams (163) pointed to the establishment of consolidated schools; Jelsma (77) suggested im-

proved attendance and census legislation, better certification for teachers, consolidated schools, and the like; Reniers (126) asked that teachers record and report attendance more accurately, attendance officers enforce legal provisions for attendance, and theaters observe state legislation; Calloway (22) urged better health facilities and better socio-economic conditions in the home.

These measures all suggest a more enlightened public opinion. Is it not possible that improvement of these social conditions would result in better school attendance? In other words, as was reported in the corresponding issue of the REVIEW during the last triennium, the "causes of nonattendance are not simple and easily detected factors but represent combinations in varying degrees of many social conditions and relationships not readily noted or controlled. Both the remedy and the prevention of nonattendance mean, therefore, that the best of case-study technic must be put into operation, and that programs of education affecting pupils, teachers, parents, and the community must be so developed that the social conditions underlying nonattendance may be remedied" (68:168).

Administrative Organization

The best piece of research it has been the writer's privilege to examine during this triennium dealt with administrative organization for attendance work. Wiens (162) in this investigation combined the survey technic with the case-study approach. His problem covered more than attendance service; it raised the question as to how school systems might best organize all those special services aimed at the study of pupils and at an attempt to help children adjust socially, mentally, vocationally, educationally, and morally. These services include attendance service, health service, psychological service, guidance service, and visiting teacher service.

Wiens visited and conferred personally and at length with school administrators in many city school systems of 100,000 population and more. He gathered further data from the remaining cities of 100,000 and more by questionnaire.

With the exception of Wiens' investigation, the emphasis during the last triennium has been predominantly administrative, with an increased use of the case-study approach. The problem of school attendance should be attacked from the pupil-personnel or guidance point of view.

Promotions³

Recent Reviews

Research on topics closely related to promotions was reviewed in recent publications as follows: promotion periods, acceleration and retardation

³ This section was written by Hans C. Gordon.

in elementary schools (101); pupil failure and promotion in secondary schools (101); factors contributing to maladjustment and failure (90); acceleration of the mentally gifted (107); treatment of the mentally handicapped (33); practices in pupil promotion and progress (124); physical-mental relationships in child development; physical characteristics of the retardate; marks and marking systems; motivation; philosophy of education; school progress (101); administrative provision for individual differences (92).

Reducing the Incidence of Nonpromotion

Some school systems are avoiding the question of promotion or nonpromotion by making promotion automatic. In one study (72) of the practices in 24 cities in the population group of over 100,000 there were three cities in which promotion was automatic, five in which it was partly so, and sixteen in which promotion was not automatic. Saunders (130) summarized questionnaire returns of 23 city-school superintendents by stating that it is evident that many school superintendents believe in 100 percent promotion policy, but few practice it. The three-year unit for the first three grades automatically avoids the issue for those grades (161). Reinoehl (125) reported that three-year units were tried in Rochester, Los Angeles, Nashville, Minneapolis, and Pittsburgh. Reduced failures with annual promotions were reported for cities in which the annual promotion plan has replaced the semiannual: Omaha, Nebraska (32); Hartford, Connecticut (54); Scarsdale, New York (137).

Some school systems include programs designed to improve the teacher's understanding of pupils and thereby reduce the incidence of nonpromotion. Such is the Chicago senior high-school program described by Bell (12) and Johnson (82). The Chicago high-school teachers recommended more special schools, departments, and classes; revision of the marking system; better provision for individualized instruction; and more effective motivation. In the plan for failure prevention each teacher had a daily advisory period in which to confer with failing students. Arrangements were made to adjust the work in the regular class and to have pupil tutors. Each prospective failure had a failure card on which teacher and pupil gave reasons for failure and plans to prevent it. This card was checked and signed by the principal and the parent. Substantial reductions in failure rates were reported as the result of the plan.

A junior college plan to retain failing students on probation was reported by Dement (35) to be successful, with the restoration of 98 of a returned group of 127 students. One city (127) changed from a policy of promotion on the basis of achievement to one of moving pupils through the grades at the normal rate, retarding only individuals who would profit by retardation. This was reported to have resulted in better achievement, reduced over-ageness, and a reduction in elementary-school population with consequent savings on salaries and school accommodation costs.

Asfahl (5) reported faculty discussions resulting in the statement of policies such as, "Minimum achievement of standards, although significant, shall not be the sole determining factor in promotion." Emphasis on the teacher's considering all factors involved in determining promotion was assured by a questionnaire report from each teacher for each pupil who was likely not to be promoted (167). This questionnaire included such items as "Would a change of teachers be desirable?" "Would \$60 be well spent to have the child repeat?" A useful way of understanding the learning problems of disinterested and retarded children is to visit the homes of the children (73).

Programs for Slow-Learning Children

Plans for segregation of slow-learning children were described in a number of reports (3, 16, 23, 24, 36, 59, 78, 81, 83, 99, 100, 117, 133, 140, 159). In general, the work of the segregated groups was different not only in difficulty and quantity of formal school training but also in types of activity offered. Activities of a handyman character (83), emphasis on visual materials and the resources of the community (117), family arts and the home (36, 159), and retailing (16) were provided. A recent questionnaire study (79) showed that 39 of a total of 58 cities with populations of over 100,000 reported the organization of low ability classes. These classes constituted only 1 percent of the total school enrolment. Organization of such groups seemed to be more characteristic of the larger cities than of the smaller. The most common name applied to such classes was "prevocational," although "ungraded," "special," "adjustment," "occupational," and "opportunity" designations were given. Satisfaction with such classes was indicated by 32 of 39 cities reporting. Cowen (30) provided a list of occupations employing pupils who are normally retarded in the traditional school curriculum.

Programs for Students of Superior Ability

In general, acceleration for students of superior ability was not favored by high-school principals (105). On the other hand, the practices in three large cities permitted acceleration for superior students to the extent of gaining a year in Grades IX to XII (29, 37, 105, 160). The opinions of psychologists substantiated the point of view that a pupil who is unusually mature physically and socially as well as mentally can profit in every way from a moderate degree of acceleration (105). It may be desirable to accelerate in some areas and to enrich in others. Thus, in one conference (148), in which this matter was considered, many agreed that acceleration was better for capable students in sequential school subjects such as mathematics, and that enrichment was better in content subjects such as history and social sciences. The usual procedure permits students of superior ability to be accelerated in elementary schools and to progress only at a normal rate in high-school grades. It may be desirable

to reverse this procedure by providing both reasonable acceleration and enrichment in special classes in the elementary grades, and rapid progress in the secondary schools in the regular curriculum without segregation (105). One study (56) indicated that accelerates succeeded well in college with high average scholastic marks and a high degree of participation in the social activities of the college. Four-fifths of the accelerated young people believed acceleration was good for them. Accelerated students were at least equal in social adjustment to nonaccelerates of the same age (44).

Evaluations of Promotion Policies

Cook (27) reported a study of 312 potential failures in December 1938 in St. Paul. Groups equated with regard to chronological age, Kuhlmann-Anderson IQ, and achievement scores were selected. Half of the pupils were promoted and half of them were failed. A total of 32 comparisons of achievement test means were made between the promoted and failed groups, and the final score was a tie. Sixteen differences were in favor of the passed groups and sixteen in favor of the failed groups. From this it was concluded that as far as achievement is concerned the crucial issue appears to be not whether the slow-learning pupil is passed or failed but how adequately his needs are met wherever he is placed. No promotion practice, be it universal promotion or the maintenance of high achievement standards, really comes to grips with the vital problem, namely, that of furnishing each teacher with adequate instructional materials, teaching procedures, and a point of view which will enable him to cope with a range of ability of from six to ten years in his classroom.

Cook (26) also reported a study in Minnesota involving nine pairs of schools matched in social and economic status, and in training and years of experience of the teachers. In each pair there was one school in which retardation was relatively high (0.8 years) and another in which retardation was relatively low (0.3 years). The following differences were discovered: (a) the average IQ level in the upper grades of the schools with high retardation was reduced by the presence of over-age, low-IQ pupils; (b) pupils of equal mental ability achieved no more in schools with high standards than in schools with low standards; (c) the range of specific abilities was no greater in schools with low retardation; (d) there was some evidence that in every subject except arithmetic the adjustment of instruction to the ability of the child was superior in the schools with low retardation.

Correlates of Success and Failure in Schoolwork

There were two studies involving consideration of numerous data for each student in a failing group compared with similar data for each member of a successful but otherwise comparable group. Conklin (25) reported upon the failures of pupils with IQ's of 130 or over in a Brooklyn high school. The study included a control group of pupils with similar

IQ's who were not failing. By an interesting technic of determining potentials of maladjustment and potentials of adjustment, an impressive amount of data was studied for each individual. The data included school records, physical examinations, psychological examination (three mental ability tests, a battery of language and nonlanguage tests, and a battery of personality tests), a set of seven questionnaires, a visit to the home, student diaries, a psychiatric examination, and a study of family backgrounds. In spite of the large number of potentials of maladjustment and of adjustment studied, relatively few potentials were able to differentiate the failing from the nonfailing group. The chief factors distinguishing the failing group were as follows: (a) girls (but not boys) lacked interest in activities known to characterize studious people; (b) there were certain maladjustments in the mothers' personalities, faults in the discipline employed by the home, and disapproval by the parents of the child's selection of companions; (c) the combination of a typical family and faulty familial discipline and filial relationships apparently produced an undesirable effect. The sharpest distinction between the failing and nonfailing groups was made by the psychiatrist in his suggestions concerning therapy. The study indicated that people may have a considerable number of strong potentials of maladjustment and still adjust. Some potentials of maladjustment do not eventuate in actual maladjustment, and some potentials of adjustment do not eventuate in successful adaptation.

A study was reported by Heaton and Weedon (67) of probationary students in four small middlewestern colleges by a plan designated as cooperative. In this plan the investigated students worked with the investigator in planning and carrying out the study and in interpreting the results. The following advantages were claimed for the cooperative plan: (a) there was greater validity in the findings because students understood what was wanted; (b) the question of establishing rapport was not even raised because the students themselves decided that certain things should be investigated; and (c) aspects of student experiences about which it is ordinarily difficult to obtain information (personal finances, family relationships, social and emotional problems) were investigated readily. Here again relatively few of the numerous data studied showed real differences between the probationary and the semicontrol group. Frequency-of-practice scores for a group of study habits were not adequate for distinguishing between the successful and the failing groups. In another investigation (18), differences in study habits did not distinguish between failing and successful students in the first two years of college.

Failure at one level continued to be associated with recorded failure at lower levels (19, 70). This is to be expected if the carefully controlled experiment of Sears (131) is to apply in classroom situations. Sears studied the levels of aspiration of successful and unsuccessful children for certain tasks in arithmetic and reading by varying artificially the degree of success in previous similar tasks. She found that successful children set their levels of aspiration more accurately than did the

unsuccessful. The unsuccessful child either set goals too high, hoping thereby to get commendation for his effort, or he set goals too low, trying to get commendation for achieving his goals even when they were lower than socially acceptable levels. A number of reports listed the causes of failure given by students and teachers. In general these "causes" were probably symptoms of more basic maladjustments. Most teachers gave high rank to lack of effort, poor attendance, lack of ability (48, 74, 82). From the pupil's point of view, failure occurred most frequently because of lack of interest, poor home conditions, insufficient study, and dislike of subject (48). From this, the importance of student interests is evident.

Failing students (81) were more interested in mechanical things and in the pursuit of personal pleasure and immediate satisfactions than in striving for ultimate and more distant satisfactions. Problem cases stayed out late at night more frequently, did less homework, drove automobiles for pleasure to a greater degree, and attended more shows. Klein reported (91) that failing students like vocational subjects most and academic subjects least.

Pupil Personnel Records and Reports ⁴

Improved records are not ends in themselves. Records, no matter how complete, are not a substitute for that personal knowledge and understanding which are attained only through intimate association of counselor and pupil in a common effort to solve problems. The utility of records lies in their ability to foster a more complete understanding of pupils and their problems.

Recent summaries of research on pupil personnel records and reports are provided in the REVIEW under the headings of "School Records and Reports" (60), "Personnel Records" (51), "Recording" (84), and "Autobiography and Life History" (144). There are additional summaries in the Encyclopedia (101) under the headings of "Pupil Records and Reports," "Marks and Marking Systems," and "Colleges and Universities: Personnel Records."

Preparing Record Forms

In the preparation and revision of record forms, a preliminary procedure frequently used is to assemble record forms from other school systems. Such was the procedure followed for the schools of California (17) in which 527 forms were studied, and a provisional form was made up and evaluated by 410 educators. A variation of this procedure is reported (10) in which employment application blanks were procured from twenty-five large corporations. A composite blank was made and used for the students of a junior college. New record forms or desirable revisions are described in a number of reports (10, 34, 89, 98, 106,

⁴ This section was written by Hans C. Gordon.

114, 143, 150). In general, the changes tend to emphasize personality description, anecdotal records, interests, out-of-school activities, and achievements as material for guidance interviews in addition to data normally required for school organization.

Items Included in Cumulative Personnel Records

Items included in cumulative personnel records were described in a number of reports (11, 17, 34, 38, 58, 85, 89, 98, 128, 138, 143, 149, 150, 158, 170). In some cases the cards were described as being used successfully over a number of years or as newly introduced forms. In addition to the usual items of attendance, marks, and credit needed for formal transcripts these records mentioned the following additional items: family and cultural background (11, 17, 89, 128, 138, 143, 150, 158); scores in psychological tests, either recorded in graphic form or as a numerical record (11, 34, 58, 128, 143); personality and character ratings (11, 34, 98, 138, 143, 150); extracurriculum activities (11, 34, 128, 143, 150, 158); students' statements of abilities, likes, dislikes, interests, plans, reactions, and problems (89, 128, 138); physical and mental health (11, 34, 89, 128, 150); sex attitude and civic attitude (158); records of conferences (11); special talents evidenced by actual accomplishments (128); space for notes and remarks (89, 150, 158); and anecdotal records (11, 34, 38, 85, 98, 101).

Anecdotal Records

Descriptions of incidents of behavioral significance assumed increasing importance in the list of reported research on personnel records. The pioneering experiences of the Rochester Athenaeum and Mechanics Institute were reported by Jarvie (76). This study described the development of a master list based upon anecdotal records. This list was suggested for possible use with large class groups such as are found in public schools. The materials included in the master list were grouped under the following headings: personal adjustment, adjustment to others, adjustment of others to the individual, adjustment to personal program, and adjustment to scholastic achievement. The list was also suggested as a mnemonic device to recall incidents that could not be written up fully at the time of observation. Jarvie (75) reported that anecdotes tended to be recorded with greatest frequency during the early periods of residence; grades that were descriptive tended to become anecdotal in nature; as the teaching load increased, the number of anecdotes per potential class hour of contact tended to decrease; approximately one-half of the anecdotes concerned behavior other than classroom achievement. Jones (85) summarized data at a high school for a ten-week period during which anecdotal records were used. Sixty-six percent of the teachers wrote one anecdote for 15 percent of the students, two or more anecdotes for 6 percent, and no anecdotes for 79 percent. One teacher

(among eighty-nine) wrote 20 percent of all the anecdotes. McCormick (98) reported the use of anecdotal records in a junior high school; Driscoll (38), in an elementary school. Anecdotal records were used in addition to the usual records rather than as a substitute for them. The reliability and validity of observational records can only be established through frequent recording of items with similar content for each individual, so that the basic pattern of behavior is established. Then variations and inconsistencies take on meaning (76).

Uses of Cumulative and Other Records

The extent to which cumulative records were used in a high school was reported by Galbraith (57). In a two-month survey, an adaptation of the American Council cumulative record form was consulted by half of the staff of the school with an average of fifty-two consultations per person. Information regarding objective tests was sought more frequently than any other single item and constituted 37 percent of the reasons for consultation. The kind of test data sought more frequently than any other was scholastic aptitude. It required fifteen minutes to service each card annually. A study by Beck (10) suggested that when junior college students accepted the significance of the data included in a cumulative record, the fact that the data were being recorded had a wholesome effect upon behavior. Eighteen school procedures were analyzed by Smith (136) in which pupil personnel records were used. Some of these were: making the school census; filling application blanks for colleges; filling application blanks for positions; reporting to parents; enforcing attendance laws; adjusting curriculum offerings; guiding and counseling. A cumulative record card coded for Hollerith machine tabulation and used to facilitate research was described by Embree (43). Behavioral ineffectivenesses discovered through the use of anecdotal records were classified by Jarvie (76) into four levels: (a) those requiring no treatment—normal maturation will ordinarily overcome the difficulties; (b) those requiring procedures that could be administered by an intelligent and sympathetic teacher or counselor; (c) those requiring the services of a trained psychiatrist; (d) those that seem to go beyond psychiatric or medical aid.

Evaluation and Effective Guidance ⁵

Evaluating the Functional Aspects of Pupil Ability

Taba (146) and Tyler (154) have found that evaluation of human behavior is too often viewed as a measuring of final results rather than as a means of diagnosing difficulties and successes encountered in reaching the end results. Taba (147) has pointed out the need for evaluative methods adapted to the more functional qualities of pupil learning and also to

⁵ This section was written by Warren R. Baller.

the "intangible educational objectives." Eurich (45) has shown not only the advantages of appraisals based upon the functioning, dynamic elements of behavior but has cautioned against the assumption that evaluation necessarily implies a repudiation of measurement. Taba (147) and Lorge (95) have given additional emphasis to these two points.

Evaluative instruments which have been constructed to meet the needs expressed above have included many designed to measure critical thinking. Rath (121) has given illustrations of interpretation of data tests and nature of proof tests, a considerable number and variety of which have been developed by him and his associates, especially for the fields of social and physical science (118). Fawcett (50) has found that tests of the nature of proof lead to better thinking habits among students in geometry classes. Grim (61) has reported similar results in the social studies, using interpretation of data as a basis of testing. Hart (65) has measured the contributions of a physical science course to logical thinking in lifelike situations. Pace (112) has developed a situations test which proves to be sensitive to changes in social, economic, and political attitudes of students. Banks (9) measured the growth resulting from home economics instruction of desirable attitudes toward homemaking and family life. Heil (69) has explored the possibilities of various visual aids in teaching and evaluating critical thinking. Arnold's experience (4) with fifth- and sixth-grade pupils indicates the values of tests of interpretation of data in working with younger pupils. The work of the Evaluation Staff of the Eight-Year Study of the Progressive Education Association has included the construction of a number of excellent tests of critical thinking (119). Advantages of such tests and others which approach experience as a process rather than a product are described by Tyler (156) and by Wrightstone (168); also by Outland and Jones (111).

The field study, as a plan for promoting learning of the functional kind, has necessitated some experimenting with evaluative procedures. Baker (8), Fraser (55), and Rath (122) have reported on the use of evaluative instruments appropriate to detecting shifts of belief resulting from field observations. Atyeo (6) devised questionnaires for the before-and-after type of evaluation. Jones (86, 87) made use of the following tests, both before and after a field study experience: scale of belief, social problems test, interpretation of data, and the nature of proof. A comparison of results was made with the data gathered from anecdotal records, interviews with parents and various follow-up activities. An important study has been made by Read (123) in an effort to determine which personality traits in children may be judged with most agreement and to investigate the factors which influence the degree of agreement. The desire to secure evaluations which reflect the gains in pupils' art appreciation has led to newer technics, described by Faulkner (49) and by Grimes and Bordin (63). The stress upon the values of leisure reading by high-school students induced Eberhart (40) to devise

methods suitable to evaluation in this area. Corey and Fahey (28) have found that the kinds of questions asked by pupils serve well to indicate types of mental activity.

Comprehensiveness in Evaluation

According to many writers on the subject of evaluation, one of the requirements of effective appraisal and of effective guidance is broader bases for judging pupil behavior and development. Tyler (154) Segel (132), Herrick (71), and Wrightstone (169) insisted upon this point as a necessary provision for assessing *all* important aspects of pupil achievement. Eurich and Wrenn (46) and Williamson and Hahn (164) have shown the fundamental importance of a wide variety of information in the effective guidance of students. Their discussions are pertinent in the present connection largely because of their descriptions of evaluative technics that have proved useful in guidance.

The need for variety in evaluative procedure, as well as appropriateness in the choice of instruments, was further emphasized in reports of Aiken (2), Drought (39), Jersild (80), and Tyler (155) on evaluation in the Eight-Year Study of the Progressive Education Association. Similar problems have confronted evaluators interested in the less formal outcomes of student achievement in college. Drought's report, mentioned previously, described the procedures employed at the University of Chicago. Aiken (1) summarized certain findings in other colleges cooperating in the Eight-Year Study, and Jones (88) and others (41) reviewed the changing evaluative program at Ohio State University. Pechstein and Munn (113) have reported on a pioneer study in measuring growth of children of the primary grades in fourteen patterns of social maturity.

Evaluating the Dynamic Aspects of Pupil Behavior

There is increasing emphasis in education upon dynamic factors in the child's development. The recent review by Symonds and Samuel (145) shows how extensively *projection interpretation* has been explored as a supplement to other ways of studying human development. McCall and Herring (96) have also summarized the work being done to relate measurement to the more effective promotion of growth in personality. Murray's extensive study (66) with projective methods in the exploration of personality may be referred to for many detailed descriptions of technics. Blos (14) has shown, in his case studies of adolescent personality, the contribution which can be made by analysis of essays, letters, records of conversation, anecdotal material, and the like, in the interpretation of personal-social adjustment. Sheviakov and Friedberg (134) have used students' responses to interest inventories in studying their personality traits. Grimes (62) has presented evidence that certain traits of personality may be inferred from students' drawings.

Another approach to the study of personality and the "influence of personality traits among children" is that of verbal portrait-matching as employed by Tryon (153). With this method Tryon was able "to discover . . . some of the aspects of personality which children consider desirable in each other."

Emphasis upon the Whole Child

Current publications of research in child development place considerable accent upon the importance of knowing the "whole child." The *interrelatedness* of the various growth processes (physical, mental, social, etc.) has been emphasized by Prescott (116), Zachry (171), and Olson (108). Olson and Hughes (109) have gathered much evidence to support the concept of "organismic age," which is essentially an average of all available measurements expressed in age values. Some of the reports of the Harvard Growth Study (135) emphasize not only the interrelatedness of growth processes (141) but the *continuity* of the processes. They present evidence to show that though there are similarities in the growth patterns of different persons there are also marked differences in the rates at which individuals proceed from one phase of growth to another.

The problem of securing, recording, and interpreting data concerning the development of the child, particularly over a long period, has given new emphasis to case studies, clinical approaches, and observational and anecdotal records. The role of these several methods in contributing to the study of the individual child was illustrated by Olson (108) and by Blos (14). Hamalainen (64), in a study of evaluative procedures in thirty schools of New York State, found a pronounced trend toward more use of descriptive records, particularly of anecdotal records. Spalding (139), drawing upon the findings of the Regents' Inquiry in New York State, observed that high schools frequently have little information about their pupils beyond the facts implied in records of school marks. Averill (7) outlined a thorough case-study procedure which has proved effective in analyzing mental hygiene problems. Evjen (47) developed and reported on the use of an instrument of contact which indicates the apparent adjustments the child is making in his school relationships. Ellingson and Jarvie (42) found that though descriptive records do not take the place of the more formal personnel information they throw additional light upon the dynamic aspects of student experience and growth. Confidence on the part of teachers in the values of descriptive records tends to increase with the length of time they are used (75).

The adaptability of behavior journals and observational records to a variety of evaluative data concerning pupil behavior is shown in the studies of McCormick (98), Buros (20), Driscoll (38), Bowes (15) and Jones and Galbraith (85). Wilson (165) has worked out an extensive form for collecting systematic anecdotal data in line with a number of objectives of child development.

Self-Evaluation in Guidance

That an increasing emphasis is being placed upon self-evaluation is shown by Troyer (152) who called attention to the importance of honoring student goals and purposes in guidance, and insisted that self-appraisal is part of such a policy in education. An interesting experiment in self-guidance and self-evaluation is one reported by Kopas (93) with college students. Every student has his own "Record and Planning Folder" in which he keeps test results, scholastic records, and other appraisals of progress as well as "tentative plans" and reports on his cooperative work experience. That students can be trained to make effective use of this plan is indicated by the results. Mott (103) and Mulholland (104) have gathered evidence that pupils' achievement is improved when they have definite responsibility in determining and reporting their progress. An examination of the results of Wrinkle's experiment in marking and reporting suggests the essential soundness of pupil participation in evaluation. Tyson (157) found in his study that there is no overwhelming tendency for students, even of low standing, to rationalize their positions. One of the points brought out in Orata's searching critique of evaluation (110) is that evaluation as an integral part of the learning process is much more talked about than practiced. Rath (120) has attributed many of the difficulties involved in securing effective evaluation to the failure to think of evaluation as an *act*, a way of viewing the movements of events toward specified goals—specified in this instance by the persons whose changing behavior is being appraised.

Summary

The foregoing classifications of researches appear to represent the major emphases in this area of evaluation. In summary form they are:

- (a) The development of ways of getting beyond the measurement of knowledge, per se, placing emphasis upon the functional aspects of ability.
- (b) The achieving of comprehensiveness in the evaluation of pupil accomplishment.
- (c) The adequate appraisal of the dynamic aspects of behavior.
- (d) The development of methods appropriate to studying the whole child.
- (e) The promotion of self-evaluation.

Other reviews of research in evaluation, of which certain parts deal with guidance and counseling, are those of Cronbach (31), Orata (110), and Buros (21).

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CHAPTER III

Counseling¹

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General Review

THIS CHAPTER will attempt to review relevant literature of the past three years under four broad categories: advances in the diagnostic procedures basic in counseling; advances in knowledge of interviewing as the primary vehicle for counseling; clarifications of the counseling function; research studies in the evaluation of counseling.

It is to be regretted that the grist of acceptable research *by personnel workers* is so small. Personnel workers in the main have been prone to rely, not always wisely, upon the research findings of test-makers, statisticians, or laboratory workers, while they continue to write in descriptive, philosophic, or argumentative terms. As late as 1941, the Committee on Research and Publications of the American College Personnel Association (19) pointed out that only a third of 230 papers in the seventeen annual reports had involved the presentation of research in any form, good or bad, whereas 38 percent of these papers were purely descriptive and about 38 percent were philosophical. This was true of an organization whose members were presumably intimately concerned with student personnel work in their daily tasks.

Under such conditions the reviewer must decide whether or not to set up a systematic framework of his own and select rigorously the literature that seems pertinent within that framework, at the risk of appearing arbitrary. The alternative seems to be the citation and notation of a large number of references without regard to any systematic structuring of the field. We have taken the risk of appearing arbitrary, and of reviewing at somewhat greater length a smaller number of references.

Before reviewing specific literature, it is necessary to comment briefly on one event of the past triennium—the publication of the *Encyclopedia of Educational Research* in 1941 (47). Definitive statements on a wide range of topics, with the inclusion of carefully selected bibliographies, provide a source book of information that warrants careful and frequent consideration by personnel workers.

¹ Bibliography for this chapter begins on page 62.

² The authors are indebted to John M. Butler and Walter F. Johnson for assistance in collecting and reviewing the materials in this chapter

Analytic, Diagnostic, or Prognostic Procedures

General Considerations

The items of information collected about a student, the most effective syntheses to be made of these items, and their predictive efficiency in forecasting the course of his adjustment have been matters of individual resources, judgment, or experience among counselors in the past. By reference to certain basic psychological facts and problems, Darley (23, 23a) has attempted to systematize the analytic phase of case study in counseling. He postulates the need for investigating systematically eight aspects of the individual. Typically low intercorrelations for individual prediction between any two of these aspects necessitate a separate analysis of each aspect. Differential growth rates and possibilities for change similarly require a separate check of each aspect. Two research problems then become interrelated: what are the elements and organizational patterns of mental life; and what are the comparative economics, reliabilities, and validities of a wide range of analytic and diagnostic technics.

The tying-in concept for the items of information directly related to educational or vocational counseling continues to be some empiric or experimental modification of the concept of the "occupational ability profile," described in the earlier writings of Viteles, Dvorak, Trabue, and Dodge. The Minnesota Occupational Rating Scales (50) represent the first workable procedure available to counselors for identifying families of occupations and patterns of abilities in case work.

A recent and significant statement of the prediction problem in counseling as well as other fields is found in the Social Science Research Council monograph entitled, *The Prediction of Personal Adjustment* (38). The first one-third of this 450-page volume is given over to a relatively non-technical and nonmathematical statement of the general prediction problems as the basis for the control and improvement of human behavior. Five supplementary studies of statistical problems and technics, including the statistical aspects of research on case data, comprise the balance of this essential reference.

Advances in test construction and standarization have been reviewed in the February 1941 issue of the REVIEW (53) and need not be discussed again. A few articles on new test materials or specific counseling uses of tests will be cited below. Similarly, it should be unnecessary to review the large number of straight prediction studies from local institutions at the college level. Segel (58) and Harris (34) have both summarized exhaustive bibliographies on this topic and the general conclusions still stand: achievement test or high-school scholarship versus college scholarship yield a median general prediction of .55; scholastic aptitude tests and college grades correlate with a median value of .44; other predictive items, singly or in combination, vary around these values. Kandel (41) has reviewed the better known aptitude tests in law, medicine, and engineering, and

presented summaries of their usefulness in predicting professional school success.

In regard to these studies, it would seem relevant to point out again that improvement of the fallible criterion of college grades might well be the crucial experimental problem. Substituting standard achievement tests for college grades as the criterion, Sarbin and Bordin (55) demonstrated markedly superior predictions. Bellows (6) has an excellent theoretical discussion of the problems and methods of evaluating vocational criteria; academic counselors might well consider its implications before embarking upon more college prediction studies. The Social Science Research Council monograph cited earlier also devoted sections to a generalized discussion of the problems of selecting, refining, and evaluating criteria in predictive work.

Pending improvements and extensions of the criteria of college success, local prediction studies and local studies of test performance of college survivors are primarily frames of reference and points of departure for counselors in any given institution. Significant studies of this type are those by Williamson (71), Stuit and Donnelly (62), and Schneider and Berdie (57), in which the entrance test scores of students surviving to graduation or to the fifth year of a longer course were summarized to give central tendency and variability values for use as first approximations in individual counseling.

Counseling admittedly involves more than testing and more than straight statistical prediction. How much more it does involve is only beginning to emerge in the form of acceptable research rather than generalized discussion articles.

General Scholastic Ability

From the analytic standpoint, there is now more evidence available on the Thurstone Primary Mental Abilities Test (Experimental Edition). Shanner and Kuder (59) at Chicago, Bernreuter and Goodman (8) at Pennsylvania State College, Darley (24) at Minnesota, and Ellison and Edgerton (27) at Ohio State have studies in print. In each study, the verbal factor tends to carry the highest weight. In the combined studies, the results are somewhat above the median value of zero-order correlations between a test of scholastic aptitude and subsequent college achievement, but the small increase in predictive efficiency may not compensate for the cost and complexity of administering the test, particularly in view of the limitations of criteria.

Thurstone (67) reported results from 710 eighth-grade children with an adapted form of the Primary Mental Abilities Test that are relevant to the growth of abilities. This population, together with a checking population of 437 children, yielded six of the seven factors found in the study of high-school seniors in the original work.

From the prognostic standpoint, three interesting longitudinal studies are available. Benson (7), in an unpublished master's thesis, traced the

subsequent educational career of almost 2,000 sixth-grade students tested during one day in the Minneapolis schools in 1923 with the Haggerty Delta 2. By 1940, only about 7 percent had received bachelors' degrees or undertaken graduate work. This 7 percent showed also the highest median IQ as sixth-graders. Ball (3) reported correlations between Pressey test scores, obtained on students in Grades II to X in 1918 and 1923, and Barr-Taussig occupational scale ratings in 1937. For the group tested in 1923, the correlation was .57; for the 1918 test results, the correlation was .71. Adams (1) traced the subsequent careers of 1,505 children in Grades IV to VI in ten schools of a Texas town. His results are in general accord with Benson's: progressively higher selection accompanying the attainment of higher education levels. From the interpretive standpoint, Traxler's (68) equation of the widely used American Council Examination and the familiar IQ, through the Otis Test, yields a common measurement referent which counselors should find useful.

The primary counseling significance of these studies is to reinforce the conviction that differential guidance, along broad educational and occupational lines, can begin in the earlier school years. Inescapable differentials in mental ability are discernible wherever well-trained counseling personnel can begin to function in the late elementary- and junior high-school year range. If differentiation of interests and aptitudes is demonstrable in or near the same age range, counseling can become technically the "continuous process" that it is philosophically described as being.

Achievement

Achievement testing has seen no major advances in the triennium that relate specifically to the counseling function. Revisions and condensations of existing batteries and the extension of achievement testing practices to graduate schools and graduate teachers represent improvements in selective or predictive instruments with which counselors should be familiar. No relevant research has appeared on the counseling use of evidence of student achievement in work experiences, extracurriculum activities, or hobbies. Estimates of such achievements, although difficult to get, illuminate case work markedly.

Aptitudes

The working definition of an aptitude is probably a narrow segment of behavior relatively unaffected by training or practice. Whether, theoretically, specific aptitudes exist, each with a differential growth curve, and in what age range the growth curves level off to a fairly stable performance, remain unknown questions.

From the analytic and prognostic standpoint, Schneider's (56) report of age and grade norms for high-school populations on the Minnesota Vocational Test for Clerical Workers is a useful addition to an already valuable test. Harrell's (33) factor analysis of mechanical ability tests pro-

vides the groundwork for construction of more precise mechanical aptitude measures. Stead (61) and his associates reviewed the experiences of the United States Employment Service in constructing specific aptitude tests. The February 1941 issue of the REVIEW has an extended bibliography on aptitude testing to which the reader is referred.

Personality Characteristics

The counselor has three broad reasons for concerning himself with the personal adjustments of students, as seen in various personality characteristics: there is limited evidence, as cited by Darley (21), of occupational selection on the basis of normally differentiated personality "type"; there is increasing evidence of personal maladjustment as a cause of job separation among adults; and there is some slight (clinical) evidence of the effect of personal maladjustment on academic achievement or at least on placement at the conclusion of academic training. The clinician would probably agree that the young, maladjusted individual may become the maladjusted adult, although there are certain transient adjustment problems associated with late adolescence that must be viewed with less alarm.

The most prevalent viewpoint toward pencil-and-paper tests of personality is one of suspicion. Yet the assumed or actual unreliability and invalidity of these devices does not automatically clothe the alternative technics with either reliability or validity. The inherently statistical nature of the numerical, or test, observation and the non-numerical, or descriptive, observation are discussed at some length in one article in a recent symposium on the social adjustment of college students (22). Each type of observation is a departure from an explicit or implicit average point in the observer's experience; is subject to systematic or random errors; is referred back to some sample of human beings in the observer's experience; is inevitably a prediction of subsequent behavior. The published discussion attempts to reconcile the extreme normative or statistical viewpoint of some workers with the absolute, "single-case" viewpoint of others.

Several analytic and diagnostic devices have been developed in this area in the triennium. Jarvie and Ellingson (39) have written a manual descriptive of the highest present level of development of anecdotal records. The technic of the anecdotal record should be an excellent first step in guidance programs that start out to win general faculty support in a small institution.

McKinley and Hathaway (36, 46), in a brilliant and long overdue collaboration between neuropsychiatry and clinical psychology, have demonstrated the diagnostic use of a large pool of personality test items, from which carefully selected and homogeneous functional disease groups respond to a grouping of items that in turn becomes a diagnostic test for subsequent, undiagnosed cases in the same functional disease group. A growing group of scales from this item pool are being experimentally studied in psychiatric investigations. The technic has promise for eventual use with normal adolescents.

A statistical parallel to the experimental process devised by McKinley and Hathaway is the technic of inverted factor analysis. The technic is given a theoretical discussion by Burt (13), and a report by Bordin (10) describes the method in locating like-behaving college students in regard to social adjustments and activities.

Within the definition of research on clinical problems, four studies deserve mention. Hathaway (35) documented a relationship between good or excellent scores on some personality tests—"supernormal" adjustment—and antisocial behavior. His cases were nine diagnosed psychopathic inferiors. Feder and Baer (28) reported a significant study of the relation of Bernreuter scores to observational and anecdotal records in a group of eighty-one undergraduate women dormitory residents. Lack of agreement between test scores and observational data was discussed in terms of the restricted response range and the inability of subjects to identify, and therefore to rate, the occurrence of certain behavior on their parts. Glockler (31) identified students with poor measured social adjustment, inducted them into social experiences as an outgrowth of a normal counseling contact, and retested to gauge the extent of improvement from this type of counseling and activity experience. The research pattern of this pioneer study has possibilities for future experimental work. The fourth article is the report of a series of studies on motivation, carried on under the supervision of Feder (29). As a pervasive aspect of personality, motivational problems are viewed in three phases: absence of needs, absence of goals, and excessive psychological barriers. Data on career versus marriage drives, achievement in physics related to reason for taking the course, and general achievement related to negative and positive stimulation regarding ability are the research bases from which the authors derive significant clinical hypotheses.

Interests

The triennium has encompassed several studies of significance to counselors in this aspect of student behavior. Traxler and McCall (69) reported test-retest reliabilities for high-school, college, and adult cases over a one- to fifteen-month interval in the high seventies and eighties on the Kuder Preference Record. Sex differences occur at all levels; age differences occur outside the high-school range only. Using college specialization as the criterion, the authors substantiate Kuder's findings of clear group differences. Adkins and Kuder (43), and Kuder (43) reported, respectively, low correlations between ability and preferences and between college achievement and preferences. Kuder (44) had a significant theoretical article on the merits of the preference form of item as it may be used in interest and personality measurement. The economy of the Kuder Preference Record is one of its strongest features; however, it needs additional occupational validation before its guidance use is adequately proved.

Sharkey and Dunlap (60) described the standardization of an academic preference blank of ninety items for Grades VI through IX. Alternate form and test-retest reliabilities range from .74 to .91 for the subtests. Validation is based on correlation with ability and achievement measures and on differentiation of achievers and underachievers.

Carter (14), Carter, Taylor, and Canning (16), and Carter and Jones (15), summarizing data from the University of California Adolescent Study, cited results from selected keys on the Strong Vocational Interest Blank for Men with tenth-, eleventh-, and twelfth-grade students. Using both the published critical scores and sigma scores, the emergence of interest patterns and of minimum relations between claimed and measured interests is clear in these early ages. In the first mentioned article, Carter attempts a description of the development of vocational attitudes as "a set of values which can find expression in one family of occupations but not in other families of occupations." Bedell (5) reported insignificant correlations between the measured interest and self-estimated interests of freshmen women in teacher training. The Strong Vocational Interest Blank for Women was used in the study, and the subjects estimated the amount of their interests in the same seventeen occupations for which the blanks were scored. The experiment is straightforward and conclusive evidence of the need for guidance attention to both claimed and measured interests.

Peterson and Dunlap (51), described a further reduction in scoring costs and time for the Strong blanks by use of unitary weights. They presented conversion procedures to bring the unit-weighted total scores back into the score range of the existing plus-to-minus four scheme. This research should be widely applicable in increasing the use of the Strong blanks—still the best instruments in this area. Darley (21) has attempted to systematize extensive clinical experiences with the Strong blanks in a total personnel program. He establishes evidence for clinical methods of pattern analysis, "expectancy tables" for interest types, and face-to-face counseling procedure on the basis of interest measurement. Illustrative case histories are followed by discussions of the origin, development, and nonoccupational determinants of interest types. Super (63) made a pioneer study of the possibilities of identifying and differentiating nonoccupational and recreational interests. He used the Strong's blank, establishing new keys on small groups with defined hobby activities. The field he opened up is of great significance in the social and personal guidance of students and adults.

The Interview

As a diagnostic and therapeutic device, the interview is the most frequently used procedure in counseling as in other fields of human adjustment, yet the amount of significant research on interviewing is exceedingly small. Only recently has electric recording and transmission equipment been adapted to this vital research problem; three university research centers are now known to have such equipment, and it is probable that an

increasing quantity of research will emerge from these programs. Fortunately, two of these centers represent sufficiently divergent viewpoints so that research hypotheses will be set up and studied under the stimulus of intellectual competition.

Bingham and Moore (9) first described the three interview functions of getting information, giving information, and modifying attitudes. These authors have now produced a third edition of their original handbook which merits re-examination by those who have profited from the past two editions, in terms of general interviewing processes.

One may view the interview situation for therapy as a learning situation for the client or student. In such a framework, the entire psychology of learning becomes relevant research and theory. Thus the following learning factors must be considered as they conduce to the success of the interview: level of ability of the interviewee; time spent by both parties on materials to be learned in the interview series; motivation and freedom from emotional blocking in the interviewee; and "teaching" approaches chosen by the interviewer. Admittedly, all the solutions of interview problems are not to be found in the psychology of learning. However, failure to relate the outcomes of interviewing to analogous learning situation seems to have been one serious omission in the literature on the interview.

Rogers (54), to date, has been most articulate in formulating hypotheses and descriptions of the interview in psychotherapy. His first premise is that of a skilled therapist "whose purpose is to release and strengthen the individual rather than to intervene in his life" works through the following processes: establishing rapport; helping the client's free expression of feeling; helping the client to recognize and accept his spontaneous self; encouraging the client to take the responsibility for making new choices; helping the client to an "assimilated interpretation" of himself, as basic to insight; helping the client grow into independence.

Under this general influence at Ohio State University, a study by Porter (52) described the construction and use of a scale to measure counseling interview procedures, preparatory to studies of the effectiveness of these procedures. Typescripts and phonographic recordings of interviews by different counselors at different stages in a series with different students were observed by trained judges. The judges show interjudge correlations of better than .90 in checking the *number* of procedures used by counselors; in 45 percent of 9,293 identified procedures, the judges agreed on the *types* of procedures used by counselors; by use of a recently devised and significant statistical method (26), profiles of judgments of frequency of use of procedures were established for each judge and the profiles were correlated as a third measure of observer agreement. The mean interjudge correlations were approximately .85. In these data, there is conclusive evidence that interview procedures can be observed with reliability as high as we are accustomed to associate with other fields of measurement. The balance of the study demonstrated intercounselor differences and similar-

ities in procedures, depending upon the counselor's viewpoints. Furthermore, different amounts of "directiveness," or by author's implication authoritarianism, accompany counselors' viewpoints and patterns of procedures used. Counselors are consistent within themselves from one interview to the next, and counselors with the same viewpoint tried to be consistent with each other in procedures used and amount of "directiveness."

This pioneer study is a significant methodological contribution. It contrasts the theories of psychotherapy of which Rogers is one exponent with the theories its author has read into the writings of Williamson and others at Minnesota, of Bingham, Strang, and Symonds. Whatever viewpoints one may take regarding the interview as a therapeutic device, it is encouraging to see interviewing finally brought within the scope of sound experimental design and research methodology. The literature to date has been given over primarily to mystic discussions of the artistry of the process or pedestrian and repetitious suggestions regarding the physical setting and precepts of "good interviewing."

From the diagnostic standpoint, Symonds (65) discussed the theoretical problems of reliability and validity as they relate to research on the interview, and then lists the factors in the subject, in the interviewer, and in the situation producing the interview which must be experimentally controlled if research is to be done. Symonds and Dietrich (66) presented experimental data on variations in time of recording the interview materials as they relate to number of ideas correctly recalled. Interviews were written up immediately after completion, two days later, and seven days later. Observers, interview number in series, and subjects were rotated to eliminate practice effects. Analysis of electrical recordings provided the criterion against which the interview reports were judged. Not only the time interval but also the groups of judges were significantly related to percentage of ideas correctly recalled. The authors set their research in the classic framework of the laws of forgetting, the obverse of the learning problem.

Super and Brophy (64) reported the stenographic recording of interviews with forty high-school juniors and seniors for the purpose of diagnosing student problems. Extensive test and background data for each case were first studied to arrive at a diagnosis. In thirty-one of the cases, the interview served only to confirm the first diagnosis and in four additional cases it clarified the first diagnosis. In the remaining five cases, the interview uncovered additional material essential to diagnosis, primarily in the area of personality adjustment. The authors' own conclusions and interpretations admit the limitations of the study: a typical amount of original data; importance of personality factors when they are crucial phases of the diagnosis; identical experimenter in both phases of the study; and distinction between diagnosis and therapy. It is a type study, however, that illustrates another research approach to the interview.

While few in number, the articles on the interview per se are laying the groundwork for a systematic attack on what has been the most elusive research problem to date.

The Counseling Function

It is difficult to put boundaries around this function, either in terms of extensiveness or intensiveness. As a matter of fact, counseling is a broad educational function when conceived of in terms of the total educational program and yet it demands highly specialized skills for certain problems. It is an essential procedure engaged in by teachers, placement workers, clinical counselors, and all other types of educational workers but in *differing degrees* of both scope and intensity. Any discussion of counseling should carry with it an indication of what *kind* of counseling is being described, that is, the scope of the problems considered, and with what *intensity*, in terms of time and skill, the counseling is being performed.

The literature on the counseling function is largely based upon *a priori* judgment rather than upon research data. Two types of recent studies will be reviewed here: those which provide a careful analysis of the essential nature of counseling, and those which include data on the incidence of counselors and counseling at various school levels.

Logical Analyses

The Section on Preparation for Guidance Service of the National Vocational Guidance Association has issued a preliminary statement on "The Preparation and Certification of the School Counselor" (40). The school counselor, whose selection and training is analyzed, is conceived of as a trained "generalist." The functions of this counselor are two in number: leadership of the guidance program of the school, and service as a "resource" counselor to whom teachers and administrators can refer students directly or from whom they can secure help with regard to their own counseling responsibilities. Stress is laid upon the necessity of a coordinated program of counseling by all workers in addition to the skill and qualifications of the trained counselors. In smaller schools, of course, such a person will perform many duties that should be performed by more specialized workers. The 12-page report goes beyond the selection and training of this generalized school counselor and analyzes the qualifications and training of both teachers and administrators for their legitimate counseling functions.

A conference of personnel leaders called by the American Council on Education in 1937 resulted in the publication of the very useful bulletin, *The Student Personnel Point of View*, and the appointment by the Council of its Committee on Student Personnel Work. This Committee soon undertook the preparation and publication of several brochures on various aspects of the total field, and in 1939 two well-written little volumes on educational and vocational counseling appeared (11, 20). The latter is somewhat broader than the first, dealing with problems of occupational orientation and of placement in addition to the function of vocational diagnosis and counseling. There is no apparent reason for the separate

treatment of educational and vocational counseling since the two are functionally inseparable in the preponderance of the individuals counseled. Something is lost by this separation, although conciseness of treatment may be gained. The concept of the counseling function in these two useful and clearly written volumes is that of an activity in which all workers participate with differing degrees of breadth and depth. Although written for college and university staff members, the value for secondary workers is equally great.

In the back of one issue of *Occupations* is a "Letter to the Editor" submitted by Arnold M. Hess (37). This letter contains a statement of seventeen basic concepts of student personnel work at all educational levels that had been prepared by a workshop group at the University of Chicago in the summer of 1940. These seventeen concepts are well considered and pointedly stated and deserve careful reading by any student personnel worker. One of them has reference to counseling and because of its terseness is quoted here: "Counseling is threefold in function: it aids students in becoming sensitive to their needs and characteristics, in reaching a tentative solution to their problems, and in developing greater self-direction." This statement emphasizes the often neglected concept that the student must assume responsibility for decisions if the outcomes of counseling are to be justified.

Each of the analyses of counseling functions just cited is the result of composite thinking upon the part of some group of professional workers. It may not be amiss to conclude this section with the judgments of two or three individual writers in the field. Williamson has written extensively upon this topic, and recent publications show an expansion of the concept adhered to in his book with Darley in 1937, *Student Personnel Work*. In his comprehensive volume on clinical counseling published in 1939, he defines counseling as *one* of the six steps in the total process of individual work with students (first outlined in the 1937 book). "Counseling refers to the steps taken by the student and by the counselor to bring about adjustment and readjustment" (p. 57) (72). This has been preceded by analysis and diagnosis and assumes the final step of "follow-up." In his book with Hahn (77), the function of counseling is presented as one engaged in by many educational workers, who differ widely in their training and scope of responsibility.

In two chapters or sections of recent books, Wrenn (78, 80) analyzed the function of counseling in higher education. In the *Encyclopedia* article he upheld the more specific concept of counseling as one phase of the total personnel program, defined as the individualized relationship between the student and counselor. The interview is said to be the focal technic used in the process of understanding and assisting the student. The relation of the faculty-adviser to the trained counselor is brought out in the second reference. The faculty adviser is said to perform a specific function—that of registration or academic advising while the professional counselor

must be prepared to serve the more inclusive needs of students and serve them at a more advanced level of skill.

Of the various writers of recent general texts in the secondary field, Myers (48) gives one of the clearest statements of the counseling function. He states that (vocational) counseling is always personal as opposed to the loose phrase of "group counseling" and that it is more than the giving of advice. The counselor *assists* the student in making a decision but attempts to refrain from making the decision for the student. Perhaps it would have been better to have said that the counselor and counselee cooperate in arriving at a joint decision.

Surveys of Counseling

Greenleaf and Brewster (32) reported on the number of "counselors and guidance officers" who spend at least half-time in guidance work in the 23,000 public secondary schools reporting to the U. S. Office of Education for the year ending June 1938. Approximately 6 percent of these schools had one or more counselors or guidance officers on half-time or more than half-time basis during 1937-38. (The lack of discrimination between "counselors" and other guidance workers should be kept in mind.) These 1,297 high schools, employing 2,286 guidance workers, enrolled a total of about one-third of all the public high-school students in the nation. The median enrolment of these high schools is 1,320. The ratio of total guidance workers to total students in these 1,297 high schools is about 1 to 900. The survey, crude though its definitions are, is exact enough to provide a picture that is not a cheering one. Two-thirds of the public high-school students of the nation are in schools not even having a half-time guidance worker. Tremendously wide variation between states and excessive counselor-pupil loads are facts that should be taken into account by the more idealistic and theoretical writers in the field.

A study made by Bailey (2) provides a little more reason for optimism, partly because the survey concerned only those who are already designated as "guidance functionaries" in the secondary schools. The amount of selection in the sampling cannot be determined from the report which is based upon reports from 555 guidance workers out of 966 to whom blanks were sent. The original group of 1,600 were randomly selected (from which original base is not known), but why blanks were sent to only 966 of these is not stated. The facts revealed about these 555 workers are, however, of distinct interest. Fifty differently worded titles were reported, with that of "counselor" applying to 27 percent. Fifty percent of all workers had administrative rank, 30 percent ranked as "counselors," and 19 percent as "teachers." It may be thought encouraging, although these were a selected group, to note that 35 percent of the guidance workers were on a full-time basis. The duties of these workers in rank order were as follows: personal advisement, planning and supervising guidance services, making community contacts, discipline, and recording data.

In contrast with the Bailey report is one by Koch (42) on the guidance work in 91 small high schools in Michigan, schools with 100 enrolment or less. Three-fourths of the schools were attempting some form of guidance although only 56 percent of the superintendents and 18 percent of their teachers had one college course or more in guidance. Some form of individual counseling is reported in 55 percent of the 69 schools having any attempts at guidance, with "guidance courses"—mostly courses in occupations—ranking next. Only 15 schools had a program that could be called "systematic." No evidence was given on whether or not anyone was designated as a "counselor" or whether any time at all was available for counselors from the regular class load.

Brief reviews of two more specialized studies may throw light upon the incidence of various sorts of counselors. Brumbaugh and Haggerty (12) reported a study of student personnel work in 282 institutions of higher learning in the North Central Association. Eighty-four percent of these institutions had "full-time or part-time counselors," with 24 percent having both full-time and part-time counselors. The impressiveness of these data is lessened when it is further reported that 77 percent of these counselors have had no specific training for their task, that 37 percent have from 20 to 40 or more counselees per person, and that 39 percent spend only from one to twenty minutes per student. Thirty-seven institutions have no one designated for either full-time or part-time counseling.

An analysis of the fields of employment of 2,261 members of the American Psychological Association who were engaged in full-time psychological work in 1940 was reported by Finch and Odoroff (30). Of this total, 888 are engaged in applied psychology, that is, psychological work other than teaching. When different fields of applied psychology are examined, that of "guidance and personnel (not including industrial)" accounts for 153 psychologists, an increase of 750 percent since 1931. There are 146 "school psychologists" in the applied group, an increase of 324 percent since 1931. While neither of these two is the largest group, that of "clinical psychologists" embracing 272 members, they have grown more rapidly than any other during the past decade. This is encouraging as indicating that there is a decided, although numerically small, flow of psychologically trained workers into many of the top level positions.

This section has indicated the dearth of careful studies of counseling functions and a lack of agreement as to the boundaries of the concept of counseling. The attempt to set up as clear a statement as possible from existing analyses and studies of counseling is essential to the consideration of the evaluation of counseling, the topic of the next section.

The Evaluation of Counseling

Evaluation is a type of research that requires the establishment of criteria against which the effectiveness of procedures and organization can be judged. It is in the prior determination of these standards or objectives,

to be used as criteria of effectiveness, that evaluation assumes its distinctive character. Evaluation is broader than measurement and it may use any one of several research methods. Tyler (70) gives a series of essential characteristics of any evaluation program: formulation of the objectives of the function to be evaluated; the validity, that is, the production of evidence regarding the specific objectives set up; objectivity; reliability; practicability; usefulness.

Evaluation Criteria

There is probably no existing set of stated criteria for evaluating a personnel program, or counseling functions in particular, that will fit all evaluation efforts. Either they are so broad that they must be broken down into specifics against which appraisal can be made or they are so specific as to fit only a given situation. Wrenn (79, 81, 82) wrote that the most fundamental criteria of evaluation in student personnel work are the desired outcomes in student behavior but that such a statement is spuriously simple. After one states such fundamental criteria as vigorous physical health, social maturity, etc., there must be derived a set of more specific outcomes. He listed a number of these, such as scholastic achievement, decrease of incidence of known adjustment problems, and increased demand by students for a given type of service. Williamson and Bordin (74), in the first of a series of articles on the research evaluation of counseling, reviewed various criteria used in evaluations of counseling and examined each in detail. These included such criteria as academic achievement, educational and vocational choices, cooperation with counselor, student satisfaction, success on the job, and predictive efficiency. Composite criteria of student adjustment and behavior are given as the most desirable.

Follow-Up Studies

Another type of study, however, produces results that have significance in the evaluation of a counseling program. These are the studies which follow up a group of former students and determine their present status and their reactions to school life. Although a good many such studies have been reported within the past three years, only two comprehensive and carefully made studies will be briefly cited here because of their implications for counseling. One of these is as well known as the much quoted Maryland Study of the American Youth Commission and the other is destined to be.

The report by Marshall and Eckert (25) as one phase of the New York Regents' Inquiry supplies significant data upon pupils who have left school, both those who withdrew and those who graduated. Of the many conclusions drawn by the writers from the present status and direct responses of this large and representative group, only a few can be cited here. The reactions of these young people show clearly that the attention given them by teachers and counselors was much circumscribed by the

four walls of the schoolroom and that they know little of the lives of pupils outside the school environment. Beyond this, these former pupils do not believe that teachers know enough of life conditions in general to help them in any realistic sense. Neither principals nor teachers were able to identify any special ability for a majority of the former students although they had been in daily school contact with them over a period of years. Over one-half of the total group claimed not to have had any educational adviser in school. The next highest proportion named their parents as their curriculum advisers. Such findings have distinct value in evaluating the counseling which these former students had, or did not have, as well as in pointing up needed emphases in the future.

The follow-up of nearly 1,000 former students of the University of Minnesota by the staff of the General College, reported by Pace (49), contains some findings of major significance. The sampling was drawn from the entering class of four separate years so that the proportion of those who dropped out at the end of one quarter, one year, etc., and those who graduated was maintained. These young people had been out of college from one to twelve years. Extensive data were collected on each of these former students, utilizing a 52-page illustrated questionnaire, with interview data collected on a sampling of the total group. While implications for counseling are not drawn by the author, they may be clearly seen by those who read the report: (a) The need for vocational counsel is perhaps most apparent, with 20 percent of the graduating and 30 percent of the non-graduating men reporting that they had not decided upon a vocational goal by the time they left college. Only 56 percent of the men graduates and 44 percent of the women graduates are in vocations in the same field as that specialized in in the University. (b) The need for assistance in social adjustment and mental hygiene is apparent with 25 percent showing a present pattern of what is called "neurosthenic" tendencies. (c) A need for counseling on the selection and development of a variety of leisure-time activities is also clearly shown since the most frequent recreational activities of over 75 percent of the group were passive in nature—reading, movies, and the radio. Less than one-third engage frequently in hobbies and less than one-half in outdoor sports.

The study as a whole showed strikingly small differences between the present status and attitudes of graduates and of nongraduates. Attendance in college through graduation did not seem to be related to any characteristic except higher income and a slightly higher degree of vocational satisfaction—no apparent relationship to cultural activities, attitudes, or citizenship. The reader does not have to believe the reviewer—he can read the report for himself!

Evaluation Studies

When one looks for studies of counseling that fall within the scope of even a liberal definition of evaluation, the cupboard is found to be almost

bare. There are many descriptions of counseling programs and many statements of the expected outcomes but little evidence of what has actually taken place in terms of stated criteria. The series of four evaluation articles by Williamson and Bordin (73, 74, 75, 76) previously mentioned contains data on actual evaluations. The first article in the series is a critique of methodology and an examination of previous studies. (An excellent bibliography is appended.) The fourth is a descriptive analysis of the case records of 2,053 students who had been counseled in the Testing Bureau at the University of Minnesota from 1932 through 1935. In this paper an analysis is made of (a) the type of problems upon which counsel was given, (b) the sources of data used by the counselors, and (c) the counseling procedures used. The second and third studies are actual evaluations of the outcomes of counseling. The *School and Society* report is a control group study, using 405 Testing Bureau cases and a control group matched upon objective data. Better total adjustment, using a composite criterion of adjustment, was found for the counseled group, and better scholastic achievement. Beyond the demonstrated superiority of the counseled group in scholastic achievement, the study's unique contribution is the establishment of the control group's success in reaching its claimed vocational-educational choices as the evaluation criterion. The third report in the series was of an evaluation of 693 counseled students, using a composite criterion of adjustment but without a control group. Over 80 percent of the counseled group showed improved adjustment. Much attention is given in this study to methods of evaluation with stress laid upon the importance of the time interval between the time the counseling is done and the time the evaluation is made.

This series represents the most complete evaluation of counseling that has been reported to date. Various methods of evaluation are analyzed and several are illustrated in the studies reported. The particular frame of references of these studies must be kept in mind: all cases were those originating in the University Testing Bureau; all were college students; the counseling done was more careful and intensive than is characteristic of much counseling in other situations. A definite preference is shown for composite rather than part-criteria of adjustment and this involves judgment rather than dependence upon strictly quantitative results. In the judgment of the reviewer this is not only justifiable but essential, but others may not agree.

Love and McCabe (45) reported an evaluation of the faculty-adviser program in effect in the College of Education at the Ohio State University. The limitation of the study lies in its dependence upon a single criterion, the judgments of the counseled students as reported upon a questionnaire. It was found that there was little difference in the reported effectiveness of the counseling performed by members of the senior staff (full-time members with professorial standing) and those of the junior staff (instructors and assistants). The eight advisers who had had the most extensive training

in personnel work ranked significantly higher than the others in every counseling area. It was not pointed out, however, that since several of these staff members devoted a major share of their time to counseling they were more "available" as to total time and office space and that this must have had some influence upon the reactions of the students.

An evaluation of the counseling program in the Worcester Boys Club as reported by Cole (17) has profound implications for personnel workers. One hundred counseled boys were compared with noncounseled boys after a five-year lapse of time. In many and significant respects the counseled group was superior to the noncounseled. More of the former were still in school, less retardation was evident, fewer had left school during a school term, more were employed, more obtained work immediately after school, more were in occupations that offered advancement, more were satisfied with their vocations, and fewer were delinquent. ". . . the advised group had gained a distinct advantage over the unadvised group with respect to every factor measured." Furthermore, the differences found are reported to be statistically significant.

This comparison provides challenging evidence on counseling values. The crux of the matter lies in *how carefully the two groups were matched and the time at which the matching was done*. The matching is reported as having been made upon some eight or ten factors but the specific method used is not described, possibly due to limitations of space. In any event, the study is one that deserves careful attention. As it stands it challenges the basic concepts of many psychologists who emphasize the significance of inherited characteristics and those of many sociologists who believe in the importance of neighborhood and cultural environment as factors in delinquency.

Evaluation Methods

It was the intention of the reviewer to report upon several analyses of evaluation methods but space forbids. Certain of these have been mentioned; the Williamson-Bordin (73, 74, 75, 76) series, the chapter by Tyler (70), and a group of papers by Wrenn (79, 81, 82). This latter author supplies also a critique of methods used in follow-up studies that calls attention to the errors that may creep into any one of the three phases of such studies. Collyer (18) outlined essential procedures for evaluating a guidance program in a junior college and discusses certain evaluation charts that might well be used in an appraisal of counseling. Beaumont (4) described methods used in an evaluation of different academic counseling programs at the University of Michigan. These programs of counseling are not described.

It will be seen that, with one exception, the studies reviewed are at the college level. The reviewer was not able to find any others at the non-college level that measured results against set criteria. Most of the emphasis in the studies reported is upon: (a) an exact statement of objectives or criteria of evaluation; (b) a carefully formulated composite criterion in

preference to specific part-criteria of adjustment (such as grades); (c) control groups; (d) longitudinal as opposed to cross-section studies; and (e) careful inferences from results that do not assume that other factors in student development have been inoperative. In general, we have only begun to *know how* to evaluate counseling and few results are yet available.

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CHAPTER IV

Guidance through Groups¹

RUTH STRANG

GUIDANCE THROUGH GROUPS is a much more subtle and difficult process than that which is commonly called "group guidance." Its aim is (a) developmental—the satisfaction of basic needs; social and emotional development; the building of values, attitudes, social norms, vocational and esthetic values; and the acquisition of knowledge and skills, (b) diagnostic, (c) therapeutic, and (d) social, in the sense of contributing to the welfare of the group as well as promoting the best development of individuals. Classes, clubs, informal discussion groups, and social events constitute a laboratory in which to solve problems of the democratic way of life. For this reason, group activities assume worldwide importance in bridging the gap between democracy as an ideal and democracy as a reality (111: 1).

There is, however, no inevitable magic in group work. The potential dangers and difficulties of guidance through groups must be faced (111: 10-11). The best thinking of certain individuals may be inhibited rather than facilitated in the presence of a group. As a result of group stimulation, quantity of work may be increased at the expense of quality. Inappropriate group experiences may decrease rather than increase the self-confidence of certain individuals, and rejection by the group may intensify their feelings of inferiority. In other cases competing group loyalties may cause mental conflicts. Excessive social activity may be harmful to the best development of certain persons whose supply of psychological energy is low. More widely recognized is the facilitation of crime through association with groups having antisocial tendency (106: 25-26). Because of these potential dangers, effective guidance through groups requires skilful work with individuals as part of the function of group leadership. In conferences with the individual, the guidance worker may discover needs for changes in his environment; in groups, the leader frequently becomes aware of personal problems which must be treated individually. The counselor may sometimes best establish relationship with resistant individuals through shared work or play (111: 27-28, 128).

The literature on group activities is predominantly philosophical and descriptive, rather than experimental. With the exception of studies of relationships between participation in group activities and student characteristics, and several recent experiments on the influence of group atmosphere or procedures on the behavior of members, the hundreds of articles and books written on group activities consist largely of surveys of group work and descriptions of specific programs and procedures. On the elementary-school level McKown (82) has incorporated the best theory

¹ Bibliography for this chapter begins on page 80.

and practice in a book entitled *Activities in the Elementary School*. On the secondary-school and college level the important findings from the extensive literature on group activities have recently been incorporated in the fourth of a series of summaries of investigations in the broad field of personnel work (111). Terry (118) has recently made brief summaries of the purpose and practices of student activities. In a review by Wilkins and Wilkins (124) the place of student activities in the junior college is briefly described and evaluated. Haggerty and Brumbaugh's report (50) of a survey of 42 junior colleges, 38 publicly controlled teachers colleges, 189 liberal arts colleges, and 13 universities accredited by the North Central Association supplies factual data and opinion about official institutional attitudes toward student organizations, financial support of these activities, student membership on administrative boards and committees, advisory and supervisory functions, scope of organizations, and participation by students. Especially timely is the pamphlet of the American Association for the Study of Group Work, entitled *Group Work in a Year of Crisis* (5). Because of these recent reviews and surveys the present chapter will be limited to a relatively small number of investigations from among the 649 already covered in the volume on *Group Activities in College and Secondary School* (111), and to important books and articles published within the last year.

Some of the practical questions partially answered by publications issued during the last triennium may be stated as follows:

1. What are the major obstacles to achieving the potential values of group activities?
2. How extensive is participation in student activities?
3. What are the characteristics of students who participate and of those who do not?
4. What are the nature, unique contributions, and procedures of different types of group activities?
5. What effective methods of work with groups have been developed?
6. How does the physical environment facilitate the group process?
7. How may group work be adequately evaluated?

References particularly relevant to each of these questions will be briefly reviewed.

Obstacles to Successful Group Work

The failure of the group-activity program to fulfil educators' expectations is due to a number of philosophical, psychological, and administrative factors. Johnston (69) covered most of these weaknesses under the following headings:

1. Lack of understanding and appreciation of the potential values of group activities
2. Lack of faith in the ability of students to make and execute their plans
3. Lack of opportunity for some students who could profit by membership in a group to participate
4. Overemphasis on competitive aspects
5. Overattention to the promotion of the organization itself
6. Invasion of school organizations by propaganda of special-interest groups
7. Lack of organic relation between informal student groups and the curriculum

8. Neglect of evaluation of group activities in terms of fundamental objectives
9. Inadequate preparation of teachers for their group-work responsibilities
10. Lack of consideration for the club sponsor's total load.

Of these ten items, several have been subjected to study or experimentation. A survey of 282 accredited higher institutions in the North Central Association of Colleges and Secondary Schools (50) indicated administrative practices which seemed to be more concerned with the reputation of the institution than with the best development of all the students. A report by Stroude (114) on kinds of group work being promoted in secondary schools called attention to jealousy and snobbery as undesirable outcomes of group work in some situations.

Clement (20) noted, in 307 secondary schools belonging to the North Central Association, some evidence of a fusion of aims in curriculum and extracurriculum activities and a tendency toward scheduling informal student activities during school hours.

It has been repeatedly shown that 50 to 75 percent of the high-school faculty are engaged in extracurriculum activities which may occupy one-seventh or more of their professional day. For this group work they have been inadequately prepared, except for individuals who have participated in some plan, such as that described by Gregg (49), of group work with adolescents as part of teacher education.

Extent of Participation in Group Activities

A great deal of interest has been shown in the extent of students' participation in group activities, although such figures mean little unless the needs of the students are also known. Extent of participation varied from 100 percent in some institutions to less than 25 percent in others. The percentage of participation reported by Haggerty and Brumbaugh (50) for an accredited group of institutions of higher learning was higher than the percentages in other surveys. The average was 84 percent, and thirty-nine institutions reported 100 percent participation.

In some cases, surveys of campus activities in individual institutions of higher learning indicated that the existing organizations do not serve a sufficiently large number of students (53, 85, 104). Others, however, suggested a superior quality of student life (123). A survey by Parr and Cummins (93) of 45 junior colleges and a recent survey of student personnel work in 151 institutions engaged in teacher education (36) both report lack of agreement among institutions with respect to specific procedures and policies.

Although earlier studies reported the largest percentage of nonparticipation among the lower socio-economic groups, a recent investigation by Cory (25) showed somewhat more widespread participation. Student groups in educational institutions justify their existence only if they supply to all the children vital experiences lacking in the curriculum or in their out-of-school lives.

Limitation of participation has been studied much more extensively than possible means of stimulating group membership. The common practice of excluding a student from certain groups because of his low scholastic record may be seriously questioned. "If group activities have the educational values claimed for them, the student who is working on a low level of achievement should not be deprived of these values. Not infrequently the failing student needs the tonic effect of success in some extracurriculum activity" (111: 41). Therefore it is necessary to limit or stimulate participation on the basis of a study of each individual. The point system, accepted with enthusiasm ten years ago, has not proved to be the solution of the problem, for, increasingly, regulation of participation in group activities is being recognized as a counseling, not an administrative, problem.

Extent of participation in particular groups is not so important as continuity of participation in wholesome kinds of leisure activities. There is some evidence that students who have been active in high-school organizations are more likely to continue their interest in similar community groups than those who were nonparticipants. Thus the problem merges into the realm of community recreation.

Characteristics of Members and Leaders of Groups

The scientific study of the relationship between participation in student activities and intelligence, scholarship, health, and "success in life" presents many difficulties. Initial difficulty is encountered in determining who is a "participant." Some investigators have used the criteria of mere membership; others, consistent and definite contribution as a member; still others, office-holding in the group or rating on a point system. A second difficulty lies in failure to control such important factors as intelligence, time spent in remunerative work, health, and reading ability. A third limitation of many previous investigations is the exclusive use of quantitative methods when more valuable hypotheses and insights might have been obtained had case-study data been included. Closely allied to this last criticism is the tendency to overlook the heterogeneity of the groups studied. By treating them as homogeneous, very real differences in relationships are ignored.

Student Activities and Intelligence

Previous investigations have shown a

. . . general tendency for both high school and college students participating in informal group activities to have slightly higher scholastic potentialities than non-participants. Although we might expect students engaged in the more intellectual types of activities to have a higher mental rating, this is not always the case. Especially in the case of girl athletes, some evidence of superiority rather than inferiority in mental ability is available. No constant relationship has been obtained with all groups or with all individuals within a group in which the central tendency is in favor of participants (111: 202).

No investigation published during the last three years has altered this general conclusion.

Student Activities and Scholarship

With respect to scholarship, several investigations have recently been reported. Janney (65), studying a number of related factors with a group of 160 college women, found participation in extracurriculum activities and scholarship to be positively related. At Purdue University (81) "activity scores" derived from ratings on activity correlated .37 with scholastic achievement and .33 with scores on the American Council on Education Psychological Examination. More significant is the table of individual scores which, in general, supports the conclusion reached by other investigators, namely, that participation in group activities appears to have a stimulating effect which results in relatively high scholarship. This same favorable relationship between college students' participation in activities and scholarship was reported in the area of dramatics by Dietrich (32). Only in two individual cases did participation in dramatics appear to have an unfavorable effect on scholarship. These individual cases, however, are of concern to the personnel worker who should be alert to discover students who are unable both to carry a heavy load of extra-class activities and to maintain an optimum level of scholastic achievement. This investigation is an admirable example of research technic in this field, illustrating delimitation of the problem, careful collection of data, appropriate statistical treatment, analysis of individual cases as well as of the group, and practical application of the findings.

In high school, as well as in college, participation in extra-class activities appears to have a beneficial rather than a detrimental effect on students' scholarship (107). Culley (29) contributed to methodology in this field by defining degrees of participation. He divided boys engaged in athletics into three classes: (a) letter men, (b) athletes who engaged in a sport to the full but did not compete in enough games to win a letter, and (c) students who did not participate in any interscholastic sport. The evidence obtained was in favor of the stimulating effect of engaging in athletics.

The results of investigations of this kind have a bearing on the practical problems of initiating new activities, limiting membership in a particular activity, and evaluating the outcomes of an activity. At any rate, the results of these investigations do not justify the policy of excluding students from informal group activities solely on the basis of low scholarship.

Student Activities and Health

Although health is a factor which should always be considered in advising students concerning group activities, few attempts have been made to study this relationship. Wilkins (123), using as a criterion of health the number of days spent in the college hospital, found that the average

number of days in the hospital for the entire student body during the year was 1.3; for the group of 58 student officers, 2.1; and for a group of 149 nonparticipants, 1.6. Results in other institutions would be affected by facilities for, and regulations and attitudes concerning, hospitalization. Moreover, hospitalization is not an adequate index of health, nor is it one that is closely related to excessive participation in student activities. More significant factors to study in this connection would be indications of chronic fatigue and minor ailments, such as headaches and colds, which are associated with and sometimes precipitated by fatigue.

Student Activities and "Success in Life"

Only very limited aspects of success have been studied. The criteria most frequently employed have been inclusion in *Who's Who*, or some similar publication, of salary and rating by employers or associates. Previous investigations, although somewhat inconclusive in general, indicate a small advantage with respect to all these criteria in favor of students who were active in extracurriculum groups in high school and college. In the last three-year period several additional investigations have been made from somewhat different angles. Hoover (61), using Terman's Prediction Scale for Marital Happiness (which is a sort of vocational-interest test applied to the single vocation, marriage), found that 177 senior college women made significantly lower scores than did Terman's experimental group of happily married women. Participation in extracurriculum activities and consequent association with men did not seem to bring the college women to a favorable position in comparison with Terman's key group. However, the most favorable scores were made by students who expressed an equal preference for boys' and girls' companionship.

Characteristics of Student Leaders

The highest degree of participation in student activities is represented by leadership. This aspect has been extensively studied and is important for followers as well as for leaders. For every member of a group needs the insight to recognize and resist the influence of unscrupulous leaders, and to cooperate intelligently with worthy leaders. Moreover, in a democratic group there is no rigid distinction between leaders and followers because each member at times assumes a position of leadership. Rath (98) emphasized the fact that leadership is a phenomenon operating under specific conditions, both the process and the end results varying with the interaction of the group, the leader's personality, and the particular conditions in which he is placed. For this reason leadership "traits" should be described with reference to the specific situations in which they are manifested.

In the high-school field the most extensive study of leadership has been made prior to the three-year period covered by this review. Nothing published recently has modified the general conclusion that "although there

are individual differences in high school leaders, investigations indicate that students of better than average scholarship appear to be attracted to positions of leadership. The leaders also tended to be slightly superior in health, intelligence, and socio-economic status" (111: 222).

In college similar conditions with respect to leadership prevail. Wilkins' study (123) of the relationship between grades and participation in extra-curriculum activities is fairly typical of this type of investigation. The officer group had a grade average 4.16 points higher than that of the non-participating students. The critical ratio of this difference is 4.31, which provides a basis for a confident judgment that a difference greater than zero would always be found in favor of the officer group (123: 655). Low marks were notably absent in this group of student leaders, and all but one of the eight officers holding responsible positions of leadership in their senior year made a definitely better scholastic record than they had made in the two previous years. Quite another aspect of leadership has been discussed by Sanderson in his *Leadership for Rural Life* (102).

Contributions of Different Types of Activities

The range of student activities includes groups that are a dynamic influence for good, those whose functioning is purely perfunctory, and those which exert a detrimental influence on the development of students and on the institution. These diverse forms of organization may be classified under four types: policy-making and governing organizations; service, social, and recreational groups; esthetic and religious group experiences; and academic-interest groups and athletics (111: 86). As it is impossible, under the space limitations of this review, to summarize the many references on each of these types of groups, the attempt will be made merely to touch on a few of the most important and original contributions.

Policy-Making and Governing Organizations

The extent to which students should participate in government has long been a matter of controversy. While agreeing that there are "areas in which students may not actually formulate policies," Jarvie advocated that they "should at least participate in the *discussion* of all policies" (66: 224). As an illustration of his point of view, he described a report on assemblies, planned and developed by students themselves, which served as the basis for actual assemblies initiated and completely directed by the students. From Antioch College (52) came a plan of student-faculty cooperation in government that was highly unified, democratic, and educational. The program of the student council as reported at Cornell University (115) included activities of vital concern to students: surveys of student opinion on campus matters, policy-making with respect to athletics, the development of a freshman orientation program, and a "House Plan" for men's dormitory units. Student forums such as those described by Price (97) stimulate students to face and analyze campus problems.

From 1938 to 1941 a number of descriptions and discussions of student cooperation in the government of high schools have appeared (1, 2, 6, 7, 14, 34, 44). These articles emphasized vital real-life situations, extending beyond the school to the community, as the core of student government activities. The most recent report of student cooperation in high-school government was made by Kelley (70) under the auspices of the National Self-Government Committee, Inc. The 1,431 replies to a brief questionnaire showed this form of student activity to be widespread. Two of the most serious limitations seemed to be that students were engaged only in trivial matters and that the officers did not function in the classroom. There is some indication that student cooperation in government is moving slowly in two directions: (a) toward participation by the entire student body instead of by only a small governing group, and (b) toward student-faculty cooperation in government as an educative process.

Service, Social, and Recreational Groups

Social sensitivity and maturity may be developed through service, social, and recreational groups. These avenues for student development have been seriously neglected (110). Although service activities are still frequently limited to narrow kinds of school service, in certain schools (14) the services rendered by student groups extend beyond the school into the community. "Aristotle went so far as to say that 'the whole end and object of education is training for the right use of leisure'" (111: 106).

There are some obvious vocational implications of social education. Wallace (120) reported that of four thousand office workers who lost their positions, 90 percent were said to have been dismissed because of deficiencies in character and personality. She stated that the kind of personality required for success in business is "more successfully developed as an extracurriculum activity than in regularly scheduled class work" (120: 153).

Some social groupings are casual or transitory, formed for conversation, dancing, or for entertainment of adult guests (111: 110-14). Others are hobby and special-interest groups. To children with special talents, hobby clubs offer an opportunity to work with others of the same interests (51). Most widely discussed are the sororities and fraternities (100).

During the past thirty years certain tendencies with respect to fraternities can be discerned. One of these tendencies is the integration of the fraternity with college life as a whole. The older cleavage between "Greeks" and "Barbarians" is becoming imperceptible, as fraternities contribute increasingly to college activities, as nonfraternity groups offer to all students many of the same advantages as the fraternity, and as many students voluntarily decide not to belong to the social fraternity. Another tendency is that toward improved scholarship in the fraternity. Recent investigations report relatively low scholarship among fraternity members less frequently than earlier studies. Still another tendency is the co-operative consideration of fraternity problems by representatives of the fraternities and of the college. This process of joint deliberation has probably contributed to the reduction of social frustration, to more wholesome and stimulating living conditions, and to greater attention to the best development of individual students (111: 127).

Esthetic and Religious Group Experiences

Since esthetic and religious experience may arise out of any situation, the group-work leader should be aware of esthetic and religious potentialities in all aspects of school and college life. Certain media, however, are definitely freighted with these experiences: an environment conducive to esthetic experiences, group work in the creative manual arts (113), group activities involving music and dramatics (84), or motion pictures and radio (40, 58, 80).

Religious experiences may be provided by programs of religious education handled with sincerity, insight, and psychological acumen (15, 23, 41, 91, 105). Horton pointed out the importance of helping young people to build "a religious structure that will be less susceptible to repudiation under the impact of increasing knowledge" (62:217). In addition to courses in religion and services of worship (43, 91), informal activities having religious emphasis are desirable, for "religion is not complete without group experience; group experience is not complete until it is religious" (9:14). Nor should opportunity for meditation be neglected (55, 120:67).

The most influential factor of all in the religious development of students is the personal influence of faculty and other students. Any interaction between teacher and student or within a group, if vital and creative, may be a religious experience out of which arise meanings, insights, and values (15, 57).

Several examples of coordinated programs of religious education have been reported. The program at Rollins College (119) illustrates the opportunities for religious education in class discussions that are part of the regular curriculum. The religious experiences derived from three Junior Hi-Y clubs was described by Dix (33). At George School, Pennsylvania (63), the religious program includes many group activities including neighborhood conferences dealing with social and civic problems and service clubs cooperating with social agencies in the community. Of the four methods, described by Bower (17), of making education eventuate in religious behavior, the first and most important is "participation in a group or groups in which religious attitudes are vitally operative" (17:6).

Articles in these two fields have been almost exclusively descriptive or philosophical, for both esthetic appreciation and religious vitality at present defy measurement. The effectiveness of group work in these areas can best be evaluated in terms of the individual student's increase in sensitivity and responsiveness to the ideal of the best life for all people.

Academic Interest Groups and Athletics

A large number of student group activities are closely associated with the curriculum, as "interclass" activity, informal activity during a regularly assigned period, or courses offered with or without credit. These

may take the form of departmental clubs, "group guidance" classes, honor societies, assemblies, and athletics.

Departmental clubs—These clubs are excrescences of subject-matter classes usually enriching the content of the curriculum in a particular field. Social studies clubs frequently discuss problems, national and international in scope, for which the handbook published by the National Education Association Committee on International Relations (89) will be found helpful. The evolution of the debating club in Columbia College into a "Public Discussion Council" was delightfully described by Hodnet (60). In a collection of articles entitled *Group Education for a Democracy* (73), Kilpatrick presented the idea of group work, not "as a separate field of work, but rather as a method to be used in all kinds of educational effort."

"Group guidance" classes—In the type of core curriculum devoted to personal and social problems, questions for discussion are suggested by students and the discussions are usually conducted by a student chairman (112:142-55). Somewhat more informal and spontaneous are the activities of the homeroom period created to restore certain values displaced by departmentalization. Dixon (35) reported that all but twelve of the seventy-three principals canvassed believed that the values attributed to the homeroom could not be achieved so well or at all by regular classes.

Leadership classes and seminars have been established in some high schools, and, according to Hand (54), in somewhat less than one in seven higher institutions; although the majority of the fifty colleges and universities responding to the questionnaire believed that a course or seminar in student-government problems or problems of campus leadership would be desirable. Battin (12) reported on a three-year experiment with a course designed to develop the ability of college students to lead discussion groups. This report supplies concrete material for a course in leadership or for use in a leadership institute. Zeleny (126:310-13) likewise presented important material on the training of leaders.

Descriptions of guidance through group activities may be found in several books and articles written during this period (3, 92). Several important experiments have been made to evaluate the outcomes of certain "group guidance" classes—Lincoln (78) and Remmers (11) on the high-school level, and Bennett (13) on the junior college level. However, none of these carefully conducted experiments gave conclusive statistical evidence of the efficacy of "group guidance" classes.

Assemblies—A new development in assembly programs was described in detail by Kuhn (75). This was a successful cooperative effort of the faculty and students of the State Teachers College at Trenton, New Jersey, using the assembly to enrich the cultural background of the students. There are enough illustrations of successful assemblies planned and conducted by students to warrant high schools and colleges moving still more rapidly in that direction.

Athletics—The potential values of athletics may be expressed in terms of specific attitudes, appreciations, abilities, and understandings (99). Whether these values are realized depends largely on program and personnel. Baker (8) obtained statements from 1,150 women and girls fifteen to twenty-five years of age which indicated that they tended to engage in less strenuous activities as they grew older. They apparently did not plan their individual patterns of activity. It is to be hoped that the popularization of athletics, as at the University of Iowa (28) and at the University of Wisconsin (59), may result in greater continuity of outdoor interests after graduation.

Student Publications

The staffs of student publications are more specialized, individualistic, and limited in membership than are most other student groups. Principals and teachers (19) believe that membership on a publication staff is worthwhile for the majority of students engaged in this activity. Twenty-five heads of schools of journalism, however, were not agreed as to the value of the school newspaper.

Criteria that may be applied to a wide variety of group activities have been stated and concretely illustrated in *The Practice of Group Work*, a series of accounts written by group leaders and edited by Sullivan (117).

Methods of Work with Groups

Methods of work with groups include all intelligent ways of getting results with classes, clubs, committees, and other organized or unorganized groups. In this area some of the most important researches in the field of group activities have recently been reported.

Description and Measurement of Interpersonal Relations

Three approaches to the study of interpersonal relations have been made: (a) the full descriptive account of a group activity, (b) the charting of relationships expressed by members of the group, and (c) the attempt to express human relations in quantitative terms or mathematical formulas.

The method of studying relationships in small groups by means of observation and short questionnaires was described and its sociological implications discussed by Newstetter and Newcomb (90). Lewin and his associates (77) have developed the "total behavior technique," which, as its name implies, involves consideration of both interpersonal relations and personal development of the participants in group activities. Rohrbach (101) especially emphasized the dynamic aspect of measuring group behavior. Equally significant is the recent work of French (47, 48) in discovering "some of the determinants of the behavior of interacting individuals in emotional situations." In order to gain further

understanding of the group-work process and interpersonal relations, Price (97) used the genetic approach, studying the processes of student life on two campuses—in Stephens College over a period of twenty-five years and at Stanford since its founding in 1892.

As a supplement to observation and as a check on whether the social structure manifested in overt behavior is the authentic feeling structure, an approach designated as *sociometry*, or the *sociometric technic*, has been developed. The *sociometric test*, the *sociogram*, and examples of *sociometric research* have been described in a number of important articles by Moreno (86, 87), Franz (45, 46), Zeleny (127), Jennings (67), Criswell (26, 27), and Johnson (68). This technic of studying the relations of individuals in a group might more appropriately be called *sociography* than *sociometry* because, with the exception of a few attempts to quantify the intensity of relationships, relations are on the whole uncovered and described rather than measured. The sociometric test may be useful in therapy as well as in research. It may also prove valuable to personnel workers in high school and college by helping them to discover natural leaders.

Experiments on Methods of Group Work

Every group leader is aware of the importance of the "atmosphere" or "social climate" of a classroom, club, or other group. This atmosphere is created, in large part, by the method of the leader. Following Pigors' earlier analysis of two contrasting methods of group work—*leadership* and *domination* (95), Lewin and his associates have recently reported important researches on the nature of authoritarian and of democratic leadership in several specific groups. The most complete account and bibliography of this series of investigations may be found in the 1940 University of Iowa bulletin, *Studies in Topological and Vector Psychology* (77). In these experiments the group and its activities were described with admirable adequacy; the authoritarian group and the democratic group were roughly equated with respect to initial interpersonal relations; and case studies of individual members were made. The results showed decided advantages in favor of the democratic groups. Autocracy tended to evoke either apathy or aggression; democracy, to produce kindly, considerate, and cooperative behavior and creative and productive work; "*laissez-faire*, in which there was a minimum of adult participation, proved decidedly different from democracy" (79:557).

Because these experiments are so close to the "real" world, the temptation to make wide applications of the results is great. This tendency is discouraged by the investigators themselves. The age of the subjects, the personality of the leader, the previous and present influence of the culture, and the nature of the group goals are only a few of the factors that might modify the results obtained in these experiments. Accordingly, it is important to repeat these experiments with various groups. In each case the structure and dynamics of the total situation should be fully described (111:248).

A very practical question, especially with reference to delinquents and mentally retarded children, is "Will democratic procedures work?" Kephart (71, 72), on the basis of his experiment at the Wayne County Training School in Northville, Michigan, answered this question in the affirmative. Permitted to govern themselves, this group of boys, whose mean age was 17.1 years and whose mean IQ was 65, demonstrated their "ability to manage their own affairs." No boy in this group has "committed any break of acceptable adolescent behavior" (71:588).

Play Therapy

The therapeutic value of group activities has been most highly developed in the treatment of maladjusted children. Designated as *play technic* or *play therapy*, this form of group activity combines many features of case work and group work. Many concrete examples of play therapy have been reported: Martin's description of psychiatry in a boys' club (83); Curran's account of group activities in an adolescent ward in Bellevue Psychiatric Hospital (30); Altshuler's experience for a year at Eloise Hospital, Michigan (4); and Cockerill and Witmer's evaluation of a psychiatric camp for children (22).

Psychodrama

Recognizing the therapeutic value of dramatics, Moreno and his associates have developed specific technics designated as the *psychodrama*, the *spontaneity test*, and *spontaneity training*. The technics are described in articles by Franz (45, 46), Sargent and Uhl in collaboration with Moreno (103), Dubin (38), and Borden (16). "The function of the psychodrama is to produce a catharsis and release of tension, thus preparing the individual for an easier adjustment in the real situation" (38:24). Skilfully employed, it has diagnostic as well as therapeutic values.

Group Discussion

Although group discussion is the most widely used of all the group technics, it has been subjected to very little experimentation. However, the published experience of skilful discussion leaders is of decided practical value (111:254-65). There have been two important investigations bearing on the methodology of group discussion. Murphy and Likert (88) had nothing positive to report with respect to the modification of attitudes through group influence. Simpson (108, 109) developed a research method for attacking the problem. He found that the college students who exerted the greatest influence on others' opinions in group discussion were not definitely superior to their fellow students in certain tests of scholastic aptitude, emotional stability, self-sufficiency, introversion-

extroversion dominance, and sociability, but were definitely differentiated from those of low influence in discussion in two respects, namely, being Jewish, and scoring high on a radicalism test.

Study of the group-work process has resulted in certain methods of ascertaining both the structure and the feeling aspect of interpersonal relations. Experiments on methods of group work have yielded hypotheses regarding the influence of different kinds of leadership. In play technics the therapeutic aspect of group activities has been highly developed and a beginning has been made in studying the process of group discussion.

Environmental Influences

Organized groups and informal activities are often handicapped by lack of physical facilities. Each activity requires a certain physical setting to facilitate the group process. It is encouraging that Engelhardt and Engelhardt in a general book on school buildings (42) emphasized and illustrated the responsibility of the school for providing space and equipment for group activities.

During the last three years new developments in student unions have been reported in several articles: a description of the large house equipped to serve as a junior college union building at Highland Park, Michigan (37); an account of the student union building at the University of Pennsylvania (116); and a list of suggested physical facilities for a completely equipped student union (56).

Except for the survey of living conditions in 151 teachers colleges made by the American Association of Teachers Colleges (36), Peck's discussion (94) of the esthetic experiences possible in the college residence hall, and Leonard's handbook for the chaperon and house mother (76), the references on the group-life aspects of housing have been meager. Jameson (64) interviewed 571 girls in a university to ascertain their attitudes toward six phases of collective living but no extensive experimental study of the effect of different housing conditions was reported in this period.

Evaluation of Group Work and Research Needed

Evaluation of group work should be made in terms of (a) changes in the individual student and in the community, (b) the group-work process itself, (c) control-group experimentation, and (d) opinions of students and graduates. Reports of evaluation during this three-year period have been chiefly opinion surveys (18, 39, 104). In general, students and graduates, on all educational levels, emphasized the value of informal social contacts, were enthusiastic about many of their group activities, and desired more guidance in the use of leisure time.

Further Research Needed

A pattern of research related to group work might well include the following features:

1. Study of groups *in vivo*. This would consist of observation of both leader and members, including records of sequences of behavior and interaction among all the persons in the group. Thus information on conditions which maintain or hinder co-operation in specific situations would be obtained (10). In addition to this record of the group process as manifested in overt behavior, the sociometric technic and the interview should be employed so as to ascertain the feeling relations in the group. Such detailed study should be made of many groups of various ages, abilities, and backgrounds, engaged in different kinds of group enterprises. An experimental slant may be introduced by noting changes in relations and behavior that take place after a definite modification of policy or procedure has been made. This type of research involving the total situation is likely to be more rewarding than attempts to find the specific cause for a specific outcome.

2. Case studies of individual members of groups. Intensive study of individuals is obviously necessary for an evaluation in terms of changes made in individuals. From many detailed studies of persons who have engaged or are engaging in definitely described group activities, the effect of participation in groups on individuals of various abilities, backgrounds, and achievements could be determined. Answers might be obtained to such questions as: "Is participation in group activities equally stimulating to persons of different levels of mental ability?" "At what point does participation become excessive?" "In what ways does participation in extracurriculum activities affect the student's scholarship?" "Is the group situation significant to individuals chiefly in terms of human relations?" "What kind of satisfactions do individuals get from doing things together?" (122). By this method the continuity of interest in the activity in after life could also be studied.

3. Study of trends by repeating certain carefully planned surveys and investigations at intervals of five or ten years.

4. Self-surveys in individual schools and colleges. By this method an institution may evaluate its group work in the light of its educational objectives, its faculty, its facilities, and its community contacts.

Research in this area is difficult. One must approach it cautiously, avoiding the error of attempting to measure the unmeasurable. Yet difficulty is not a justification for being content with quick, easy, and fictitious results. The complexities of social behavior can be accurately described and astutely interpreted even though they cannot be reduced to mathematical formulas.

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CHAPTER V

Educational and Vocational Information¹

WALTER J. GREENLEAF

MOST STUDIES involving educational and vocational information are concerned with the relationships between education and courses of study, and employment and occupations. For that reason graduate students often analyze school situations in an effort to harmonize school practices with employment opportunities; or they may survey occupations and workers for the purpose of applying the findings to curriculum revision or improvement of educational opportunity. The researches with guidance implications (59, 60, 107) in this field, therefore, are grouped under two rather large classifications: (a) educational, or those which investigate training and educational opportunities, including schools, curriculums, courses, and programs; and (b) occupational, or those chiefly concerned with employment, occupational analyses, and the investigations of occupational trends.

Education in Relation to Vocations

Elementary Education

In the elementary school the need of guidance programs was analyzed by a few researchers (6). Tenenbaum (151) reported that 20 percent of the children in three New York elementary schools were unhappy. Brueckner and others (20) noted a trend toward adapting the elementary-school curriculum to the individual needs of pupils and advocated measures for more effective mental hygiene programs in schools, as well as guidance with respect to motion picture and radio programs. Freeston (51) studied the vocational interests of one hundred elementary-school children five to thirteen years of age and found that the higher the intelligence level the "more impossible the goal." He also concluded that the children were inspired less by relatives and known workers than by their heroes and heroines, "the boys being most affected by the world of sports and the girls by the cinema." Programs for gifted children (30) were surveyed; a seventh-grade course of study in occupational information was designed to develop community and school cooperation (56); and community relationships and orientation were analyzed (85, 88, 130).

Secondary Education

In the field of secondary education, research included analytical studies of school systems (88, 89, 109), promising practices (72), cumulative records (128, 150, 156), articulation (120, 138), Negro children (123), scholastic achievement (94), and numerous other topics (83).

¹ Bibliography for this chapter begins on page 100.

Schooling and vocational adjustment—A comprehensive New York State survey (105) of schools and occupational adjustment was made by the Regents' Inquiry in a series of thirteen publications. The study was characterized by a survey of the school and out-of-school activities of pupils to show the relation of schooling with adjustment in vocational life. Little relation was found between courses taken in general high schools and occupations of graduates, and curriculum groupings appeared to have been made on the basis of intelligence alone. Of the boys, 63 percent graduating from vocational high schools entered work for which they were trained. It was recommended that initial vocational education courses be planned to meet the needs of the large number of drop-outs as well as of those who plan to graduate, and further recommended that vocational education be differentiated on a basis of grade accomplishment at three levels: (a) Through Grade IX: "Introductory survey courses should acquaint pupils with the major vocational opportunities and requirements of important occupational fields, and should help each pupil analyze his own interests and abilities in relation to the learnings involved. Each pupil should have a sufficiently wide range of such experiences to insure an intelligent choice when he must decide on his future educational career." (b) From Grade X through Grade XII for the pupil whose full-time schooling will presumably end with the secondary-school period: "To develop such habits and attitudes as will lead to vocational activity he has chosen; to acquaint himself with these major vocational processes in the particular field which will make him an apt learner on the job; to gain a knowledge of the conditions of work, and wages paid; to gain knowledge of the kind of training necessary for advancement in the field, and of where and how to obtain that training; and to secure training in basic elementary skills and to secure sufficient training in specialized skills to provide him with the marketable ability necessary to obtain a beginning job." (c) Beyond high school for those having finished the 12th grade or having demonstrated their vocational competence under adult working conditions: "The courses in the vocational and technical institutes should be designed to furnish up-grading vocational education and preparation for vocations offered beyond 12th grade but under college level."

In a number of individual schools offerings and curriculums were studied (39, 64) with varied findings and recommendations. The negative aspects (77) were often pointed out and some recommendations were made such as a more flexible curriculum for all pupils accompanied by a wide range of elective courses (96), a growth process involving the whole individual rather than only his mental machinery (139), and current curriculum materials (87). Long and short courses were recommended for incorporation into the curriculum of full-time general high schools because 90 percent of employed youth are engaged in agriculture, manufacture, mechanical industries, clerical occupations, domestic work, and

trades; and further because nearly three-fourths of high-school courses are academic, and vocational courses are usually exploratory for students in general education (117). The values of certain high-school subjects were appraised by graduates through follow-up inquiries. The results lead one to believe that more thought should have been given to both question and answer in spite of the fact that the findings of several studies appear to agree (137, 179). English, commercial subjects, and public speaking were most useful to alumni, while social studies, foreign languages, and mathematics were of least value.

To help solve certain employment problems special courses and selective procedures were proposed. Public-school training for household employment (34) was analyzed to reveal the extent of opportunities for such training and the problems involved. A retail selling course in New Jersey (55) was justified by an inquiry into the vocational choices of pupils, the number of graduates entering store positions in the state, and employment trends. Haas (65) proposed cooperative part-time retail training programs. A plan for teaching occupations in junior high school was developed (67), and related instruction for plumber apprentices (68) was suggested. The selection of students for nurses' training was studied, and significant correlations between IQ's, mechanical aptitude, and reading scores were found (54). In vocational agriculture, boys in Illinois were found to be poorly selected (74).

Evaluation of the Guidance Program

One point of departure in studying the services and effectiveness of school programs was to "evaluate" curriculums, pupil activity programs, library services, guidance practices, educational outcomes, and other features of instruction or administration (104). To improve methods for evaluating high schools and to develop an instrument that could be used by a high-school faculty in evaluating its own program, that would motivate improvement of secondary-school instruction and operation, and that could be used by an outside committee for the purpose of accreditation, the Cooperative Study of Secondary School Standards, organized in 1933, issued several studies (29). Two hundred schools were selected and nine items of evaluative criteria were applied: curriculum, pupil activity, library, guidance, instruction, outcomes, staff, plant, and administration. The main contributions of the study were the assembling of evaluative materials acceptable to secondary-school people, and the excellence with which these evaluative materials were translated into practical instruments for evaluation.

Evaluative studies of guidance programs revealed that if the value of a guidance course depends upon its affecting pupils' choices it may as well be abandoned (135) since it was the least influential factor in determining occupational choices (in New York). A series of criteria for vocational guidance programs, and various devices for measuring the extent to which

an existing program measures up to the criteria, were accumulated by the Stanford Evaluation Workshop (5). An evaluation of the educational and vocational guidance program at Worcester Polytechnic Institute (71), made by following up boys who had participated in the program since its beginning, indicated that 94 percent were satisfied with their choices. Other evaluative studies revealed weaknesses in pupil activity, in guidance service, in practical high-school courses (167), in curriculum, staff and guidance facilities (11, 171), in six-year programs (174), and in local schools (22, 127).

Guidance in the Homeroom

The homeroom as a topic for research received its share of prominence, owing perhaps to the convenience with which graduate students are able to visit and study it. Homerooms in a number of local schools were investigated (124) and found to be sources of specific information about school activities and agencies of guidance in all its phases. Attitudes of 110 Iowa teachers (145) revealed that homerooms were considered a vital part of school organization and that although their administrative function is overemphasized they can be organized on a basis of personality and character development and afford more time for group and individual guidance. Still another study of 105 schools in 43 states and the District of Columbia (156) reported that homeroom teachers were not required to have special training in guidance, although in-service training was sometimes provided. Neither adequate time nor personnel was provided for guidance activities. Half of the schools in the study offered vocational guidance programs, but few provided any means for evaluating the effectiveness of their procedures.

Guidance Programs

The need for guidance in general was stressed by numerous studies, many of which were based on findings of local schools or school systems. In Virginia a survey of 356 out of 480 accredited schools recommended a more effective program of guidance for high schools (175). In a number of areas the program of guidance was out of touch with accepted theory and practice.

Guidance practices in secondary schools, including educational and vocational guidance, were described at length by Yeo (180) and by others who studied individual schools or systems. The essentials of a good guidance program for secondary schools were described by Strang (147). The Vermont Board of Education (168) prepared a manual for the general approach to guidance through group, homeroom, and individual counseling for Grades VII to XII in the public schools. A guidance program for small high schools (176) was proposed after a study of the situation in the Marianna, Pennsylvania, high schools. Cromwell (31) outlined a program of guidance and applied it to high schools in Maryland. A record

of practice and progress in guidance and counseling at the Samuel J. Tilden High School, a large New York school, was outlined; such activities were described as work with groups toward coordination, clearing-house for information, work with individuals, and administration, organization, and personnel (12). Further descriptions are given in the following chapter.

Counseling

While counseling was treated extensively in Chapter III, a few notes will be added at this point. Without counselors or supervisors, guidance programs in schools or communities are but feeble efforts to help youth make their choices of careers and chose the proper training for placement. In a study of 23,032 public high schools (63) it was found that only 6 percent provide counselors or guidance officers on a half- or more than half-time basis; and that in the 1,297 schools with guidance officers, there were approximately 900 pupils for each counselor. More than half of the pupils in New York, Maryland, California, and Rhode Island were provided with counseling service. Sixty-one percent of the counselors and guidance officers in public high schools were employed in New York, California, Pennsylvania, Michigan, New Jersey, Illinois, and Ohio.

Counseling and the changing curriculum in ninety secondary schools were studied by Bergstresser (16) to show how some communities were attempting to improve educational opportunities. Counseling of secondary-school students in Ilion, New York (172), was facilitated by the use of achievement and intelligence tests, with particular regard to curriculum selection, differentiated assignments, marking and promotion, and remedial work in reading, arithmetic, and study habits.

Occupational counseling technics (142) described by Stead, Shartle, and others who carried major responsibility for worker-analysis studies of the U. S. Employment Service covered such items as oral trade questions, rating forms, selection and construction of sets of items, data analysis methods, technics of measurement and occupational relationships. Osborne explained the formulation of oral trade questions designed to measure trade knowledge possessed by job seekers. The applicability of the questions was verified in various parts of the country, and data analyzed so that final lists of the best questions could be arranged for later practical application in counseling work. The eight most valuable types of questions proved to be those dealing with definitions, limitations, use, procedures, location, names, purpose, and numbers. Although standardized for 126 occupations, trade questions cannot be used successfully for a large number of occupations; it was found that even in the highly skilled trades there are limitations to the number of questions which can be devised.

For use in counseling, a series of guidance charts was prepared by the faculty of Champaign (Illinois) Senior High School to present graphically the educational and cultural values of school subjects and show their relationship to modern vocations. (26).

Student Plans and Choices

One difficult task for the counselor after advising a boy or girl vocationally is to suggest a choice of educational institutions where adequate training leading to employment may be undertaken. With the multitude of colleges, trade schools, and doubtful propriety institutions in the United States, few of which are approved by accepted accrediting agencies, counselors welcome studies which help in the choice of a school or college. A number of directories were issued: authorized descriptions of 725 accredited colleges and universities (95); nursing schools as classified by the National League of Nursing Education (101); the U. S. Office of Education directories of colleges and universities listing institutions approved by national or regional agencies (118, 40); and the 1939 College Blue Book containing pertinent information about college selection (78).

Studies on occupational choice revealed that high-school pupils in Portland, Oregon, were predominantly interested in the professions (90) whereas out-of-school youth "showed more sense of occupational reality." Girls tended to choose the overcrowded fields of clerical work "while this field was slighted by the boys listed, for whom considerable opportunity exists." Salesmanship led in popularity for boys. From their study of 107 freshmen in four social science classes, Bateman and Remmers (10) concluded that the use of career books produced significant changes in the attitudes of students toward occupations, and that after studying career books students were less favorable toward the occupations of their choice. A lack of balance between preferences and existing opportunities was found after a 4-year investigation of nearly 80,000 high-school seniors in Wisconsin (23) and 24 percent of the boys and 14 percent of the girls were undecided as to their future. A general conclusion was advanced that guidance procedures cannot be intelligently determined at present because of confusion of aims and purposes of American education.

Since the establishment of the Occupational Information and Guidance Service, Vocational Division, U. S. Office of Education, in 1938, the staff has been engaged in making numerous special studies, bibliographies, and researches in the field of guidance. These cover the need not only for specific training of guidance workers but for use of cumulative records, determination of the essentials of a guidance program, occupational and educational information, follow-up studies of graduates, occupational surveys, and other data which concern occupational and educational relationships (61, 62, 63, 107, 128, 181).

Higher Education

Because a university is a community in itself, the guidance situation is different from that in secondary schools. The liberal arts college, whether independent or the core of a university, must accept the guidance responsibility of assisting students to enter employment or professional schools. The professional school is in effect a vocational school wherein a student

is learning a particular field of work, if not training for a particular job. Studies, then, in the field of higher education with implications for guidance may relate to trends, the junior college movement, occupational orientation, and student employment.

Recent trends in higher education (73) pointed to more individualization: reduction of student programs of study from five or more courses to four or less, interrelation of subjects, avoidance of narrow specialization, and acceptance of responsibility for guidance. The Chicago College Plan including guidance phases was evaluated after ten years of operation (18). Curriculum and instruction in higher education were analyzed for 276 colleges in the North Central Association (21). For those interested in figures the U. S. Office of Education issued *Statistics of Higher Education for 1937-38* and similar biennial documents that are valuable historical sources as to trends with reference to enrolments, college finance, professional students, degrees, and other items (161).

The junior college movement (93) was the subject of several local studies which concerned evaluation of educational opportunities for youth (19, 126) and criteria for the establishment of public junior colleges proposed for Kentucky (1), Texas (43, 169), and New Jersey (173). Eells (37) furnished information on 494 approved junior colleges, and Johnson (79) on the duties and obligations of junior college deans.

Occupational orientation of college students was undertaken in the occupational laboratory of General College, University of Minnesota, to permit a more individualized technic in presenting guidance material (66). A semester course in orientation was required of students entering Grades XI and XIII of the Pasadena (California) Junior College; it was found (15) in evaluating the outcomes that the orientation course functioned satisfactorily in its informational aspects, but that more time should be given to mental hygiene and personality study.

In paying for a college education at least one out of every three college students is engaged in some part-time employment (62). An inquiry made in forty-two Michigan colleges of 2,939 students on NYA college and graduate aid studied personal histories, economic status of families, and types of duties performed (122). It was found that students employed part-time were able to do satisfactory college work if they budgeted their time carefully. Academic and extracurriculum achievements of working women students (98) were not harmfully affected by a moderate amount of employment; while working did not depress marks, it tended to diminish an expected rise, and partially self-supporting students did not carry a lighter academic load when they were working. In a 2-year study (119) of 246 Ohio State University students in 1937 it was found that: outside employment as an excuse or alibi for failure, dismissals, absences, and requests for readmission is sheer rationalization; the nonworkers had almost identical academic experiences; if a student has the mental capacity, he can work without fear of poor marks. In Kansas State Teachers College a moderate worker group of students employed six to twenty-one hours per

week ranked highest in academic success; a group working twenty-four or more hours per week ranked second; and a group working fewer than four hours per week ranked lowest (134).

Research on Occupational Opportunities

Classification of Occupations

Prior to the issuance of the dictionary of occupational titles no adequate occupational classification had been standardized and every writer developed his own classification, usually based upon the outmoded census data. In 1939 Rulon and Blanton (129) arranged a code system for the classification of various types of workers using the ten major divisions of the census and sixty-six industrial fields. In 1940 a classified index of occupations in the United States (160) and an alphabetical index (159) were issued by the U. S. Department of Commerce to aid in standardization of occupational classifications. With some modifications the occupational classification in the index is the standard classification formulated during 1938 and 1939 by an interdepartmental committee sponsored by the American Statistical Association and the Central Statistical Board. The arrangement of the census classification, however, differs somewhat from the arrangement of the Standard Classification and a considerable number of the composite occupation groups of that classification have been subdivided in the census classification (160).

Perhaps the dictionary of occupational titles was one of the most outstanding pieces of occupational research for guidance officers (163). In June 1940 the dictionary of occupational titles was released (1939 imprint) enabling authors, interviewers, and researchers to use standard classifications and code numbers for American occupations. Based on the findings of 54,189 job analyses resulting from observation of jobs by trained analysts, 17,452 separate jobs were defined and 12,292 alternate titles mentioned. A significant occupational classification and code were incorporated and conversion tables for the census made available. The dictionary, unique in many respects, especially in its value to those interested in the classification of American occupations, marked the completion of a major step in the Occupational Research Program conducted by the Division of Standards and Research of the U. S. Employment Service. Seven classifications embrace all occupations: (a) professional and managerial occupations; (b) clerical and sales occupations; (c) service occupations; (d) agricultural, fishery, and forestry occupations; (e) skilled occupations; (f) semiskilled occupations; and (g) unskilled occupations.

These classifications have been largely adopted by the 1940 Census, although to check the agricultural situation of the country, eleven classifications are being used: (a) professional and semiprofessional workers; (b) farmers and farm managers; (c) proprietors, managers, and official, except farm; (d) clerical, sales, and kindred workers; (e) craftsmen, fore-

men and kindred workers; (f) operatives and kindred workers; (g) domestic service workers; (h) protective service workers; (i) service workers, except domestic and protective; (j) farm laborers and foremen; and (k) laborers, except farm.

The job definitions and descriptions were prepared for the use of public employment offices and related vocational services, information being obtained by trained field analysts from direct observation and job analyses for the most part, augmented by other sources of occupational data such as associations, libraries, and employers. Wages, hours, and jurisdictional matters are not considered.

Occupational Trends

The prediction of trends in occupations was undertaken and a number of sources of information have been published to aid in foretelling future needs. The biennial census of manufactures, 1937, a well-organized piece of research, reported on manufacturing and printing and publishing industries and gave detailed reports for cities having 25,000 inhabitants or more (158). Industrial and agricultural trends in relation to the demand for labor in the St. Louis area were set forth (166) by the U. S. Employment Service as an aid to the development of methods and procedures which can be applied to the solution of similar problems in comparable areas. Rochester (New York) industries cooperated with the Board of Education in a survey concerning the number employed in mechanical industries, graphic arts, building trades, electrical, chemical, clothing, textile, and shoe manufacturing industries. The findings and reports of trends helped school teachers in the guidance and placement of local students (170). Anderson and Davidson (4) studied occupational trends based on the census of occupations 1870-1930 to show shifts in occupations due to various influences. Occupational trends in California with implications for vocational education considered such factors as employment, volume, pay rolls, earnings, duties of workers, and training opportunities (24).

Edwards (36) inquired into the financial ability of the various states in relation to their youth population to support public education; and education in relation to occupational trends. "The modern worker must be prepared to shift from job to job, from occupation to occupation, and even from industry to industry." Holly (75) suggested a technic for forecasting the replacements needed in 11 selected professions in 6 selected cities. As the needs for professional workers vary among individual communities, no blanket forecast derived from data for the United States would be adequate. The procedure was recommended as of value for guidance, and for controlling the numbers of students to be admitted to professional schools. Occupational trends in Iowa with implications for vocational education were summarized to show a pronounced shift from agricultural to other occupational fields, a marked increase in the number of women employed in commercial pursuits, an increase in the number

of men employed in manufacturing and trade, and a need for a broader program of preparatory training (28, 45, 46, 47, 48, 49).

Occupational Surveys

Community surveys of occupational opportunities for the benefit of youth have been carried on in a number of areas and more are in prospect in certain cities. Although these local surveys do not follow identical plans, the information obtained and the predictions made are of vital importance in community counseling. Steps in making a community survey include preliminary planning; determining the scope, content, and method; preparing the work plan and budget; preparing forms; introducing the survey; directing survey personnel; collecting the data; and editing and tabulating the material (181). The following are examples of such surveys:

Arkansas. Occupations in 107 business firms in Fort Smith, Arkansas, were surveyed (155) to show the need for vocational guidance of pupils in the business department of the high school.

Georgia. The Georgia Youth Survey (103), completed in 1939, helped Georgia youth to know the actual number and classification of the jobs existing in the state's largest cities, and aided young people to view intelligently the occupational pattern of their communities in fitting themselves into the employment picture as it actually existed.

Illinois. Schloerb (132), in a description of procedures and work accomplished by the Chicago Department of Occupational Research, offered occupational information and accounts of trends useful in guidance and in curriculum revision.

Iowa. A vocational survey of Davenport (50) was made to determine the need for vocational education as related to training for entrance into city occupations.

Ohio. The occupational pursuits and vocational opportunities of girls and women (7) and of boys and men (8) in Toledo were analyzed as a basis for planning a girls' vocational education program. The Canton occupational survey of 1938 aimed to give a picture of the local employment situation with a view to developing in the young people a proper understanding of their occupational opportunities (14).

Pennsylvania. An occupational survey in Oil City was carried out (32) to determine the extent to which the offerings of vocational shop work in the schools were justified by the demand for industrial workers. Industries of New Castle (38) were surveyed for vocational education. A survey of Pittsburgh (58) revealed that half of the young people got jobs through their own efforts or those of friends, rather than through the schools.

In addition to occupational surveys, there were surveys of agriculture, economic status, employment, women's work, and occupational requirements.

Agriculture—Hatch and Lathrop (70) devised procedures to be followed in making local surveys to discover occupational opportunities for young men in farming.

Economic Status

Economic conditions of youth sixteen to twenty-five years of age tend to be determined to a measurable extent by those of their parents (125). All evidence points to the fact that there is a definite relationship between socio-economic level of the family and the occupation and education of its youth. Stratification will continue as long as employment opportunities are so largely dependent upon the family's economic status. A study of 150 Iowa families (28) shows different aspects of depression conditions on laborers, farmers, and businessmen. Edwards (35) attempted to group gainful workers belonging to the same socio-economic class without particular reference to the different occupations pursued or to the specific skills involved. In a study of parental income and college opportunities, Goetsch (57) found that equal educational opportunity is not enjoyed in Milwaukee. Greenleaf (61) analyzed replies from more than 46,000 alumni (1928-35) in twenty states. A standard questionnaire was returned by thirty-one cooperating universities. One of the findings was that median salaries of men ranged from \$1,314 for those one year out of college to \$2,383 for those out eight years, whereas median salaries of women increased over the period from \$1,092 to \$1,606.

Age and Employment

A survey of job placement facilities in a city and a statistical analysis of the data were accomplished in Worcester, Massachusetts (106). The reduction in employment in 1937-38 in twenty-six New England factories resulted in an increase in the proportion of workers in each five-year age group over thirty years, and a decrease in the proportion in groups under that age (110). Employers expressed a high regard for the older workers. Two-thirds of the men hired were under thirty-five years of age, but in 1937-38 two-thirds of the lay-offs were also from this group. Productivity records for three firms indicated no definite tendencies toward diminution in production with advancing age, except in a few special jobs. Some employers preferred young workers because of their versatility and flexibility, and also because the prospect of pensions was not so immediate. Fitzgerald (42) analyzed employment opportunities in four manufacturing plants in Lancaster, Pennsylvania, to determine the chances of inexperienced youth in competing for jobs with older workers who have been laid off previously.

Women's Work

The legal status of women in the United States, 1938, according to studies by the Women's Bureau (162), indicated their civil and political

rights, including the rights to their earnings and to the earnings of their children. A striking uniformity was noted in the ratio of women's wages to men's. In spite of changes in the general wage level, in business conditions, or in source of labor supply, and regardless of locality, type of industry, period of time, method of pay, or other qualifying factors women's wages fall below those of men (113, 114, 115). A survey of the status of married women (17) indicated that there is liberality toward married women employees in the South and Middlewest, and in consumers goods industries; that married women are more acceptable as factory workers than as office employees in some plants; that there is more liberality in the retention than in the hiring of married women; and that there is in general a definite trend toward an increase in the proportion of married to single women workers.

Women with chemistry training found positions chiefly in the medical field, in high-school teaching, in research, and in the nonchemical fields; and the percentage of unemployed is small (52). The position of dean of women as a personnel officer in colleges, universities, normal schools, teachers colleges, and high schools (148) was analyzed. Boston agencies that offer vocational testing, counseling, and free placement were surveyed in one study (91), and suggestions were offered for improving the counseling services for out-of-school young women.

Occupational Requirements and Information

Nineteen fields of professional endeavor and 59 nonprofessional occupations in New York State are licensed and regulated by state law (99). State legislation permits personal qualification requirements to be determined by local legislation in 48 occupations. State statutory restrictions that pare away a person's "individualism in entering and pursuing any occupation he may choose" were shown (69) to increase the growing need for vocational guidance. The 1939 requirements for certification of teachers and administrators for elementary schools, secondary schools, and junior colleges were summarized by Woellner and Wood (177).

Besides the dictionary of occupational titles, a great deal of occupational research has been devoted to descriptions of jobs, job analyses, and monographs covering a single occupation or an occupational family. A number of these studies were written primarily for guidance and placement officers who collect occupational information for the purpose of advising boys and girls about careers, requirements, training opportunities, and employment. The content of a good occupational monograph from the standpoint of the counselor was outlined for the use of those engaged in making such studies by a research committee of the National Vocational Guidance Association (102). New job descriptions (164) issued by the U. S. Employment Service covered the cleaning, dyeing, and pressing industry, bakery products industry, domestic service and

service and maintenance jobs, and the lumber and lumber products industry. Science Research Associates (133) issued a collection of monographs with essential facts on the 100 most common occupations in America—occupations in which 75 percent of the working people are employed.

In addition several studies were made on specific occupations or on units discussing a single industry or trade (81). The history of the Federal Civil Service since 1789 was summarized in a document of the Civil Service Commission (157) and O'Rourke (108) furnished further details about government employment. In six cities in Oklahoma there were more jobs for general clerical workers than for other employees and a particular need was noted for those who could perform more than one clerical duty successfully; practically all clerical workers were graduated from high school and half of them attended a business college (144).

Vocational information for the foundry industry in the St. Louis area, prepared by the Job Analysis and Information Section of the St. Louis Research Center, answered questions on the history of molding, the making of castings, on working conditions, hazards, wages, and opportunities of work (165). Machine shop occupations in Philadelphia were analyzed by Horowitz to aid in the guidance and training of youth in public schools (76); data on the number, nature, and requirements of such occupations were furnished by 172 firms employing 90 percent of the workers. A study of the printing trades and their workers (27), sponsored by the Occupational Research Section of the National Vocational Guidance Association, revealed opportunities for employment in various localities throughout the United States. An analysis of selected positions in public social work in fourteen states was made by the American Public Welfare Association after surveying a group of public welfare agencies (3). Opportunities and requirements for shipmasters on the Great Lakes were studied by Satterly (131).

Teaching as a career was analyzed by several writers. Experience during the first five years in tenure and in nontenure states was traced through questionnaire replies from 1933 teacher-training graduates (100). Fernberger (41) found that a woman has forty chances out of one hundred of obtaining a position in academic psychology.

Follow-Up Studies

Various individual schools and groups of schools found out what happened to their recent graduates (82) and added new occupational material of particular value to counselors and to those interested in curriculum revision. In the college field the University of Michigan followed up the 1928-36 graduates in government service to determine the nature of their work and its relationship to their university training (136). Graduates of 1928-35 in thirty-one cooperating higher educational institutions were studied with respect to economic status (61). Gannaway (53) found that scholastic failure was the most frequent cause

among 157 freshman women who dropped out of college, although half of the withdrawing students continued training at other educational institutions. Secretarial science and medical secretarial courses at Colby Junior College (New Hampshire) were fulfilling their function as terminal courses; a large number of graduates were continuing to study or work with no definite vocation aim in mind (153).

Fifty subjects were selected to determine whether the Columbus (Ohio) Counseling Bureau was carrying out its functions as a guidance center (121). That schools were not meeting the needs of those of superior ability was a conclusion of Terman (152), who summarized the results of a follow-up of 93 percent of the original group of intellectually gifted children.

In the secondary field, follow-up studies have been carried on widely in many individual schools. For example, in Mecklenburg County, North Carolina (97), it was found that 13 percent of the 487 graduates in 1939 were attending colleges, and 16 percent other educational institutions; of those employed, the majority had secured jobs through personal application or friends and relatives, rather than through agencies; 30 percent of the 144 drop-outs left school because of failure or indifference, 29 percent left to go to work, and 41 percent left for miscellaneous reasons. Findings of a follow-up study in the Philadelphia public schools, 1936-37, related to the influence of economic conditions on employment, further education of the graduates, effect of the age handicap on ability to secure employment, and relation of training received to positions obtained (111). The implications of a follow-up study for guidance and curriculum were emphasized by Foy (44).

In addition to surveys and follow-up studies some attention was given to investigating the average net incomes of dentists (84), osteopathic physicians (86), professional engineers (92), school employees (130), and nurses (2); merit rating scales in representative branches of industry (141); occupational success (146, 149); unemployment (154); and limitation of occupational opportunities because of religious belief (143).

Meeting Youth Needs

Among the different suggestions advanced for meeting the needs of youth there were these statements: each community should build its own program (140); standards in the commercial field in junior high school should be increased (9); information should be gathered by means of a community youth survey on numbers and wants of out-of-school youth (25); more specific job training and more advice in planning further education was the need of New York youth who had left school (33); the lack of educational and recreational facilities contributed to delinquency and incorrigibility, while training for leisure created higher standards of living (80).

The importance of building an educational program around preparation for work was stressed by the findings of a Philadelphia study (112) describing what happened to 9,457 young people after they left the public schools. The schools needed more educational and vocational guidance services, clarification of the objectives of the academic curriculum, and courses in family relationships. In addition the junior employment service needed to be enlarged in order to serve adequately out-of-school, out-of-work youth. Because 1,750,000 young people enter the labor market every year, the problem of matching youth and jobs was attacked by the American Youth Commission. Bell (13) concluded that federal and state agencies have important contributions to make in the development of adjustment programs. For practical purposes the local labor market was pointed out not only as an appropriate area in which to conduct research, but as an occupational adjustment laboratory, and an area in which to conduct certain operating phases of an occupational adjustment program. Coordination of activities and agencies was mentioned as an essential characteristic of an effective adjustment program. Schools should give students an awareness of their occupational potentialities, and an effective school will offer vocational education as an essential element to enrich curriculums and supplement vocational guidance. The whole adjustment process should lead directly to placement.

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CHAPTER VI

Programs of Guidance¹

ARTHUR E. TRAXLER

THE NUMBER of recent articles and monographs describing programs of guidance is fairly large, but the amount of research in this area continues to be small. Numerous difficulties beset any attempt to appraise guidance programs either by means of a carefully controlled experimental procedure or through rigid statistical analysis. The complex of variables in any normal guidance situation is rather baffling even to trained research workers. It is not surprising, therefore, that counselors who write in this field usually present general surveys or enthusiastic reports of their own guidance practices accompanied only by subjective appraisal of the results.

It is encouraging to note, however, that the three-year period covered by this review probably has produced more significant research pertaining to guidance programs than any similar earlier period. The American Youth Commission, the New York Regents' Inquiry, the Implementation Commission of the National Association of Secondary-School Principals, the Study of the Relations of Secondary and Higher Education in Pennsylvania, the Educational Records Bureau, and other groups have issued reports that have important implications for the guidance and personnel programs of secondary schools, and perhaps of colleges.

The published reports on programs of guidance tend to fall naturally into the following divisions: (a) elementary-school guidance, (b) guidance in secondary schools, (c) personnel programs in higher institutions, (d) out-of-school and adult guidance, and (e) programs of guidance in other countries. The second and third groups, which contain the bulk of the reports, can be subdivided into (a) surveys of guidance practices and procedures, (b) studies of the value of certain guidance procedures and of various means of appraisal, (c) studies leading to identification of problems of interest to counselors and personnel workers, and (d) descriptions of programs usually confined to a single institution or school system.

The present report will follow the organization just outlined. It is realized that the descriptions of programs as indicated in the fourth subdivision as a rule contain little or nothing of a research nature, but it is believed that some of these articles by their very concreteness may offer more real help to counselors in service than do some survey studies which present a formidable array of statistics from which only fairly broad and rather vague conclusions can be drawn.

¹ Bibliography for this chapter begins on page 120

Elementary-School Program

Few studies and articles dealing with elementary-school guidance were published during the period under review. It is probably correct to say that, in most elementary schools, guidance has not emerged as a concept separate from the instructional process. This is a natural and probably a desirable state of affairs in the usual elementary-school organization, where the contacts of the pupils each year are mainly with one teacher whose daily instructional and counseling functions are closely interwoven. A few reports, however, indicate an awareness of a need for a guidance program at the elementary-school level in addition to that which is provided by the classroom teacher. Macfarlane (46), for example, reported a ten-year child guidance program undertaken at the Institute of Child Welfare of the University of California. The main purposes were to study the development of many aspects of personality and to investigate the relationships between behavior patterns and other variables. The sample consisted of 252 children and their families in Berkeley, California. Extensive records beginning with the prenatal period were collected and a combination of case history and statistical analysis was used. It was concluded that answers to questions concerning the dynamics of personality depend upon the mutual interaction of many factors. Correlations were reported between physical and mental measurements made at various age levels.

Munson (50) described the adjustment service carried on through the Bureau of Child Study of the Chicago Public Schools. Through the work of a staff of physicians, psychologists, and teachers, complete case studies are made for selected children and frequent clinics are held for diagnosing reading disabilities, behavior, and speech disorders. Nolte (52) reported a program of pupil counseling in which the Boynton B.P.C. Personal Inventory and the Torgerson Diagnosis of Pupil Adjustment were used. Fifty-two pupils in Grades V-VIII were selected for study. Both instruments proved to be of value. The causes of maladjustment were principally low intelligence, inferior home environment, and physical deficiency. The counseling of maladjusted pupils was effective in two-thirds of the cases. The importance of a full knowledge and understanding of the underlying causes of maladjustment was emphasized. The guidance program in the schools of Ann Arbor, Michigan, was described by Campbell (10). The program, which was based on a mental hygiene approach, was carried on by a staff including a psychologist, a physician, two nurses, a dental hygienist, and a mental hygienist.

Comprehensive and well-organized guidance programs in four different communities are described in Chapter III of the Nineteenth Yearbook of the Department of Elementary School Principals of the National Education Association. Kawin (38) presented a broad philosophy of guidance and showed how this philosophy was applied to the guidance program in the public elementary schools at Glencoe, Illinois. Fike (21)

described a similar program in the public schools of Scarsdale, New York. Bresnehan (6a) outlined the guidance activities in the Boston city schools and stressed the contribution of a central school department of investigation and measurement. Perry (54) discussed individual guidance in a system of rural schools and indicated ways in which it promoted physical health, personality adjustment, scholastic interest and achievement, and the development of special talents.

Surveys of Secondary-School Guidance Programs

Some of the surveys of programs of guidance made during the three-year period were broad in scope. In one chapter of the April 1939 *REVIEW OF EDUCATIONAL RESEARCH*, Jones, Lloyd-Jones, and Harley (37) reviewed the literature on programs of guidance and counseling for the period September 30, 1935, to September 30, 1938. The summary included higher education and out-of-school and adult programs, as well as programs of high-school guidance. A bulletin prepared by Greenleaf and Brewster (25) and published by the United States Office of Education presented summary tables and a directory of public high schools having counselors and guidance officers. Hamrin and others (27) surveyed guidance practices in public high schools and made suggestions concerning desirable practices. The conclusions of this study indicated wide discrepancy between theory and practice of guidance in high schools. Bailey (2) reported the findings of a comprehensive questionnaire survey of procedures in preparing, certifying, and selecting public-school counselors and summarized expert opinion concerning the preparation of counselors and the functions that should be expected of them. Roemer and Hoover (59) presented a summary of the responses to a questionnaire returned by sixty-four deans of boys in high school, which showed that the functions of deans in secondary schools are not well defined.

Several surveys have been concerned with guidance in certain areas or certain types of secondary schools. A study of guidance service standards in New Jersey was made by Gallagher (23). He summarized the guidance needs indicated by 1,200 high-school teachers and the reports of 153 high-school principals who were asked to fill out the "Guidance Service" booklet of the Cooperative Study of Secondary School Standards. There was marked agreement among the teachers that the school should accept responsibility for educational and vocational guidance. The report by the principals indicated that while many New Jersey high schools have admirable guidance programs, the use of psychological aids and the attention given to placement and follow-up of pupils are limited in aim and amount. McClintock (48) gave a description of guidance programs based on a free-response questionnaire sent to schools in New Jersey, New York, and Pennsylvania. As a part of the California Youth Study, Jones (35) summarized the replies to a questionnaire returned

by guidance and counseling officers in 276 public high schools in California. The study indicated the kind of guidance given, the methods used, and the changes resulting from guidance activities. Both individual and group guidance was given by 75 percent of the schools. Jones (36) also summarized practices in vocational guidance in secondary schools as shown by replies to a questionnaire received from 397 school principals, 283 of whom were principals of public high schools. He concluded that there is wide variation in the vocational guidance programs of California schools and that while lack of materials, equipment, and personnel are a real obstacle in some schools, much more could be done with present means if the school officials studied better guidance practices and sought more accurate evaluation of the procedures used.

An extensive study of vocational guidance in Catholic secondary schools was carried on by Sister M. Teresa Gertrude Murray (51). Weak points in the guidance programs were the inadequate provision for presenting occupational information and the limited use of comparable tests. The study presented detailed recommendations for the development of vocational guidance.

Values of Certain Guidance Procedures

One of the few controlled experimental studies of diagnostic and guidance procedures was made by Fahey and Waller (19) in the Wisconsin High School. Certain standardized diagnostic instruments were used with the experimental group, and remedial procedures were then applied by trained and experienced case workers. The particular diagnostic and guidance services applied were effective in twelve of the sixteen cases, and the case workers were of the opinion that their efforts had been valuable even beyond the objective evidences of change.

An especially noteworthy follow-up study in connection with six schools was carried on by Landy and others (41) under the auspices of the Implementation Commission of the National Education Association. The purpose of the study was to discover the means by which a secondary school can get valid information about the degree of occupational adjustment of its school-leavers and clues concerning desirable changes in the guidance and educational programs of the school. The sample consisted of 914 young people, including boys and girls, both withdrawals and graduates. The youth had been out of school one and a half to five and a half years. The data were collected by means of a carefully controlled interview technic. The conclusions of the study indicated that "specific training of attitudes and habits in specific job situations with opportunity for self-direction and self-control seem to make for better adjustment on the actual job. Definite attempts at instructing youth in planning and self-appraisal (which are closely related) through such means as individual counseling, group guidance, a comprehensive testing program, and an enlistment of the entire faculty in helping to guide the pupils

re practices which seem helpful" (41:80). A manual was developed in connection with the study and was published separately (42).

Two long-time studies in which comparable tests and cumulative records were emphasized have been made available in recent years. The first was the study of the relations of secondary and higher education in Pennsylvania. A complete report of the study was made by Learned and Wood (44) in Bulletin No. 29 of the Carnegie Foundation for the Advancement of Teaching, and certain projects in the evaluation of secondary-school progress were reported by Learned and Hawkes (43) in Bulletin No. 31. This exceptionally comprehensive and thorough study demonstrated beyond question the importance of cumulative objective measurement in a guidance program. The data obtained in the main study for the same students beginning in the seventh grade and extending through college brought out clearly the need for differential guidance based upon a continuous analytical study of the aptitudes, attainments, and interests of each student. The projects in evaluation of secondary-school progress as reported in Bulletin No. 31 were based on an experiment in three volunteer high schools in which the accumulation of course credits was replaced by demonstrated understanding as measured by objective tests. At the end of the high-school course, the evidence indicated that in general science, foreign literature, fine arts, history, and social studies, the experimental group was significantly ahead of a control group which had proceeded along conventional lines.

The other experiment was a public-school demonstration project in educational guidance carried on by the Educational Records Bureau (76) in seven school systems under a grant from the Carnegie Foundation. Each school system attempted to develop a measurement, record-keeping, and guidance program to fit its own situation and made use of annual tests to measure growth. There was no attempt to set up a controlled experiment or to achieve uniformity in the program of the different schools. At the end of the five-year period covered by the study, the conclusions indicated that significant improvement had been made in cumulative records, teacher training, counseling, adjustment of instruction and curriculum to individual needs, and marking and reporting. The experiment appeared to have influenced the guidance programs of other schools in the geographical area in which each experimental school was located.

Identification of Guidance Problems

One of the most comprehensive studies having implications for guidance was conducted jointly by the United States Employment Service and the American Youth Commission, and was reported by Bell (4) in *Matching Youth and Jobs*. This study showed that of the nearly two million youth who enter the labor market each year, few have had job experience and only a small percent are occupationally classifiable. The book presented in simple, practical language the nature of an occupational adjustment

program and showed how it could function through school systems and other agencies present in most communities. Patterns for local action were formulated through practical programs.

In *High School and Life*, a study carried on under the direction of Spaulding (68) in connection with the Regents' Inquiry into the Character and Cost of Public Education in the State of New York, there are many challenging suggestions for guidance programs. Chapter IV, "Preparation for Vocations," and Chapter IX, "Educational and Vocational Guidance," are especially significant. The picture of the status of vocational guidance in secondary schools presented by the study is not a favorable one. Large numbers of pupils on the point of leaving school have no vocational plans or have plans which are out of line with their abilities and opportunities. The success of pupils just out of school in getting jobs depends largely on luck, accidental contacts, and personality. The kinds of jobs obtained bear only a crude relation to the amount and nature of previous school-work. More than half of those who have jobs will have to leave their present employment if they are to earn enough to marry, live decently, and stay out of debt. It appears that this situation is due partly to the lack of effective guidance while the pupils are in school. High-school pupils tend to elect the subjects which in the judgment of school officers are least likely to yield valuable educational returns. More than one-half of the pupils choose their courses without having received advice from anyone. The majority of the high schools offer no assistance in educational choice. The outstanding exceptions are the junior high schools which provide seventh- and eighth-grade try-out courses. Nine-tenths of the academic high schools assume no concern for the pupils' vocational adjustment when they leave school. Usually it is only the vocational schools that take responsibility for the vocational placement of their graduates. However, programs by which pupils may be more adequately prepared for out-of-school problems are in the making in certain schools.

A book by Smith (64) helps provide a practical answer for the question of how to assist high-school students in locating jobs and preparing for them. It is based on conditions in New York City and the state of New York. In this study, the existing markets in both the professions and the trades were surveyed and the number of trained workers was estimated. The use and value of psychological testing to determine job aptitudes was discussed. Of special interest to high-school teachers and counselors preparing pupils for college is a study by Hale (26), who followed a large group of secondary-school seniors into college and analyzed their transition experiences. Among other aspects, a detailed list of problems falling under ten different types of maladjustment should be useful to personnel workers.

Descriptions of Guidance Programs in High Schools

The descriptions of programs of guidance at the secondary-school level are so numerous that it is possible in this review to do little more than give

a selected list of articles and books containing such descriptions. Fairly broad programs of educational and vocational guidance carried on in individual high schools were described by Brown (7), Davey (16), Gentry (24), Hawkins (29), Hollingshead (31), Plant (56), Simonds (63), and Stevens and Farquhar (70). Hollingshead's book describes the procedures and results of a nine-year program of socialization carried on by the faculty of the Ashland School at East Orange, New Jersey. Programs in which vocational guidance was stressed were presented by Anderson and Murphy (1), Beebe (3), Buting (9), Craf and Moffatt (14), Henry (30), Jacobsen and Davis (34), and Willis and Healey (77). Beebe's article describes an unusually well-rounded program of vocational training and placement in the Essex County vocational schools in California. Henry's article, which pertains to one aspect of the guidance work in Fort Smith, Arkansas, is unique in that it reports a cooperative program of occupational adjustment which was initiated by the businessmen.

Bostwick (6) reported a follow-up study of young people who did not go to college from the Denver Manual Training High School, one of the thirty schools participating in the Eight-Year Study of the Relations of School and College of the Progressive Education Association. She identified the kinds of vocational problems with which the students received no help. Cleland (12) gave an account of an unusual follow-up survey in Pittsburgh, in which motion pictures were taken of high-school graduates at work on their first jobs. Culbert and Smith (15) described the program of the Junior Consultation Service of New York City, sponsored by the Vocational Service for Juniors, the State Employment Service, and the local branch of the National Youth Administration. Selected guidance programs were described by Strang (74), Chapman (11), and Detjen and Detjen (18). Martens (47) presented types of clinical organization for child guidance in communities of varying size.

Surveys of Personnel Work in Higher Education

A report by Russell (60) of the Proceedings of the Institute for Administrative Officers of Higher Institutions, 1940, dealt in a comprehensive manner with student personnel services in colleges and universities. The report explained the need for personnel services as seen by representatives of colleges, universities, and industry; discussed the services in five institutions, including the University of Minnesota, the University of Chicago, Northwestern University, the LaSalle-Peru Township High School and Junior College, and Antioch College; and considered in detail the question of understanding students, including the kinds of information needed. The final section was concerned with the evaluation of student personnel services. Sturtevant and others (75) surveyed trends in student personnel work in colleges and universities. The position of dean of women was found to be increasing in frequency and importance. Trends toward greater use of coordinating committees, recognition of services of health officers, and emphasis upon faculty participation were observed.

Two interesting surveys of personnel work in junior colleges were reported during the period. Koos (40) surveyed the personnel program of thirty-eight public junior colleges and reported that guidance was one of the dynamic areas of junior college education. The other report consisted of a symposium on personnel work in California junior colleges (55) with articles by Grace U. Bird, Hugh M. Bell, and J. W. McDaniel. Bird summarized the responses of 26 junior colleges to a checklist of personnel practices. All the junior colleges assumed responsibility for guidance, but in general the objective data available for use in personnel work were not extensive. About half of the colleges practiced academic follow-up, and less than half of them reported employment follow-up. The self-appraisal by the junior colleges of their personnel work was summarized by Bell. Among the needs indicated by the colleges were greater clarification of objective in personnel work, determination of the information to be collected about the students and how best to record it, and articulation of the personnel program with the adjustment of the student when he leaves the college. McDaniel gave a composite picture of the junior college students themselves. At the time of admission, slightly more than half were planning courses leading to transfer to a higher institution.

The guidance programs of schools and colleges for Negroes were surveyed by Smith (66). Of fourteen representative cities, eleven had organized plans for educational guidance for Negroes and eight had programs of vocational guidance. Of eleven private colleges studied, ten had established guidance programs. Of nine state and municipal colleges, seven had guidance programs. Except in one instance, there was no evidence that any of the institutions had attempted to obtain information concerning the value of the guidance provided to the students. The author indicated a marked need for specialized training in guidance for Negro teachers.

Studies of Various Predictors and Means of Appraisal

In a study of the characteristics of successful dental students, Robinson and Bellows (58) investigated the predictive value of a variety of measures, including manual ability tests, predental point-hour ratio, the Cooperative Tests in Zoology and Chemistry, and the American Council Test for Primary Mental Abilities. The mechanical and manual ability tests and the achievement tests were found to be of some value, while the primary mental abilities tests did not prove effective as predictors of success in dentistry. Ryans (61) analyzed the data obtained in the Ninth Annual College Sophomore Testing Program and compared the obtained scores with self-appraisals of the students made on a five-point rating scale. The results of the comparison indicated that many students are very inaccurate in rating their own abilities. These findings suggest a need on the part of students for basic information concerning their own abilities and for increased use of objective technics in student personnel work.

Identification of Adjustment Problems

A report of academic adjustment problems by Smith (65) was based on careful case-study diagnoses of 173 freshman girls by eleven student deans. One hundred and twenty-six different problems were classified into eleven groups, which were arranged in order of importance according to the opinion of the girls and the student deans. Emotional problems led the list, and study methods and habits of study were second in importance. The adjustment problems of one hundred women who were graduates from colleges were surveyed by Stone (73) and the educational implications of the experiences of this group were indicated. The need for more adequate guidance was indicated by the large number of women who reported wide divergence between expectations concerning college at the time of entrance and later judgment of the values received. One of the suggestions resulting from the survey was for the establishment of vocational placement and testing bureaus for college women.

Description of Guidance Program of Institutions and Organizations

An unusual type of cooperation between colleges and secondary schools in guidance was reported by Houston (32), who described the assistance given by the Colorado Association of Educational Counselors to secondary schools in advising seniors about whether to go to college and, if so, where. The Association supplements the secondary-school guidance in several important ways. It has published a booklet for use by secondary-school and junior college officials. Descriptions of the personnel services of large metropolitan junior colleges were provided by Snyder (67) and by Brown and McCallister (8). Snyder's article emphasized the value of personnel cards. The report by Brown and McCallister dealt with the personnel program of the Herzl Junior College in Chicago.

The personnel program of the Rochester Athenaeum and Mechanics Institute, in which attention is centered upon the individual through various procedures, including the anecdotal record, has been reported from time to time in educational literature. A recent article by Randall (57) presented the guidance philosophy of that institution and indicated the activities which are aimed at the development of self-directing individuals. The procedures followed at Loyola University in freshman guidance were reported by Fitzgerald (22). Psychological examinations, achievement tests, aptitude tests, and English placement tests have an important place in the program. Similarly, Woolf (80), at Stephens College, discussed the work of the guidance clinic set up to help students discover aptitudes, interests, and needs. Information is gathered by means of interviews, testing, observations, anecdotal records, and reports from different departments. Case-study procedures are used extensively.

Because of the dearth of information on staff personnel research, special interest attaches to an account by Oppenheimer (53) of the research attack

upon personnel problems at the University of Louisville. The article indicates that the program of self-evaluation by the staff has caused a shift from interest in subjectmatter to interest in students. Under the direction of a committee on personnel problems, careful diagnostic studies are made of incoming students. The individual analysis is based on the American Council cumulative record for college students. Measurement with comparable tests is an important aspect of the program.

An article by Davis (17) provided one of the few accounts of the guidance of graduate students. This article describes the plan of group guidance of candidates for graduate degrees during the summer session at the University of Colorado. Specially organized noncredit courses form the basis of the program. The report comments favorably upon the results of this kind of approach to guidance at the graduate level.

Out-of-School and Adult Guidance Programs

A bulletin of the United States Office of Education prepared by Hawkins and others (28) provided a résumé of practices in guidance in use throughout the United States. The survey covers types of programs in school, locality, and state. The State Child Guidance Service provided by the California Bureau of Juvenile Research was described in a detailed report prepared by Fanton (20). In order to develop a preventive program, the Bureau has given practical demonstration of child guidance technics in various localities, hoping to lead the communities to develop similar programs of their own. A unique statewide educational counseling program was initiated recently by the University of Washington and the State College at Pullman (69). The project consisted of educational counseling of high-school seniors through a series of half-hour radio broadcasts twice a week during a six-week period. The material of the broadcasts is to be made available in permanent form in a volume entitled "The High-School Senior's Collegiate Career Book."

Various communities are recognizing the problem of the vocational guidance of out-of-school youth and adults and are making a systematic attempt to meet this need. One of the best illustrations of this type of guidance service is the work of the Emily Griffith Opportunity School of Denver as reported by Stoddard (72). The school, which serves some three thousand individuals annually, offers to out-of-school youth and adults many phases of occupational adjustment, including occupational orientation and placement. The results of the guidance and adjustment procedures are followed up continuously by instructors, coordinators, and placement officers.

A community counseling service by the Ypsilanti Board of Education, National Youth Administration for Michigan, and the director of the University of Michigan Bureau of Appointments and Occupational Information was described by Bennett (5). The service provides educational and vocational guidance for in-school and out-of-school youth and adults in the community. An evaluation study of the Adult Guidance Service of

New Haven was reported by Coe and Habbe (13). The study was based on fifty cases selected at random from the clients. The conclusions of the study were favorable to the educational and vocational guidance provided.

The development of CCC camps has created a potentially important guidance agency for out-of-school youth. A study of guidance in Camp 127, Pittsfield, Massachusetts, was summarized in a bulletin of the U. S. Office of Education (33). The purpose of the study was to determine the effect of individual guidance upon participation and quality of work in a voluntary CCC educational program. The conclusions were favorable to this type of guidance.

A survey made by Woal (79) of the job requirements of more than two thousand workers in twenty-three industries had important implications for vocational training. One of the conclusions of the study was that both the highly skilled worker and the unskilled worker are losing ground, and that the semiskilled worker is on the increase, except in the occupations of tool maker and machine setter.

Of special interest during the national emergency was a service bulletin on defense training in vocational schools (62), which outlines plans for cooperation of all important agencies in the selection of trainees for the vocational-training program for national defense workers.

Guidance Programs in Other Countries

Few studies of guidance programs in countries other than the United States were found for the period under review. MacDonald (45) described in some detail a guidance program instituted on an experimental basis in the Edinburgh educational area. Individual analyses based on information obtained by means of a variety of tests and home, school, and medical reports were undertaken. The requirements of sixty-five different occupations were surveyed by means of a questionnaire sent to employers and employees. Vocational interviews were held with two thousand young people who left school to enter some field of work.

The frequencies with which various features of a guidance program appear in Ontario Secondary Schools were surveyed by Stevens (71) by means of a questionnaire. Kidd (39) described the guidance program at Scarboro Collegiate Institute in Canada. The program included a placement service in connection with which pupils were trained in interviewing and applying for jobs. Vocational guidance work in New Zealand was discussed by Winterbourn (78) and by McQueen (49). Winterbourn sketched the historical development of vocational guidance in New Zealand and summarized the national program. He also offered a critical evaluation of the work. McQueen surveyed the vocational guidance and placement system with a view to evaluating the methods and organization adopted. He reported the use of various aids in guidance, including tests, record cards, report forms, occupational information, and case histories, and made suggestions for future guidance work in New Zealand.

Needed Research

It seems obvious that the greatest research need in this field is the careful evaluation of specific guidance technics. Surveys of present practices are helpful, but they do not show what current practices, even in the best of guidance programs, actually help to improve the educational and vocational adjustments of individuals. Briefly stated, the needs are (a) a detailed statement of guidance objectives in terms of concrete outcomes that are verifiable by objective means; (b) a clear-cut analytical statement of the procedures that may be used in arriving at these objectives; and (c) a variety of controlled experiments in which an attempt is made to apply the procedures and to appraise the results. It is useless to expect either the harried counselor, immersed in the numerous details of dealing as best he can with the problems of his advisees, or the guidance theorist, remotely enthroned in his graduate classroom, to do this type of research alone. The problem calls for cooperation among guidance experts, personnel workers, and statistically trained psychologists. It also calls for tedious and expensive long-time follow-up studies. Until such studies are made, the technics of guidance programs at all levels will continue to be limited by the lack of a sound factual foundation.

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CHAPTER VII

Preparation of Teachers and Specialists for Guidance Service¹

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A REVIEW OF AVAILABLE MATERIAL reveals few research studies dealing specifically with preparation for guidance service. There are, however, some stimulating discussions of various phases of the problem which may well form the background for future research. In the following summary, some of the most important of these will be included.

Elementary-School Counselors and Teachers

Material on this topic in the field of elementary education is very scarce. Two studies relate to the training of teachers to deal with personality adjustments. Rivlin (17) reported that training of teachers for this responsibility is lacking. He says that the best methods should involve (a) careful selection of teachers; (b) the organization of all activities, classroom and extra-classroom, of the teacher in training so that they will contribute to the development of the teacher's own personality; and (c) special courses dealing with personality problems of children that would enable the teacher to deal intelligently with certain personality problems and make her aware of her own limitations and to know when to seek the assistance of a specialist.

In discussing the in-service training of teachers for dealing with personality problems, Koch (13) wisely said that there is no one best method of helping teachers to understand the personalities of their pupils. The initial selection of the teacher is basic. Courses in child psychology, child development, behavior problems, and guidance are only the beginning; these must be followed by in-service training. For this she suggested as valuable: lectures, reading materials, study and conference groups, case conferences, demonstration teaching, participation in preparing records and record forms, surveys, extension and summer-school courses in psychology, education, and case work.

The American Association of Visiting Teachers (2) has formulated professional requirements for visiting teachers who are now, in fact, the guidance specialists in many elementary schools. The following are the chief requirements: (a) a bachelor's degree; (b) sufficient credits in education to enable the visiting teacher to work effectively in schools; fifteen credits were suggested; (c) suggested courses in education include history and philosophy of education, progressive methods, classroom management, supervision and improvement of instruction, tests and measurements, problems of children, educational psychology, child study, psy-

¹ Bibliography for this chapter begins on page 133.

chiatry, and mental hygiene; (d) one year of teaching experience (or supervised teaching) or one year of visiting-teacher work; (e) at least one year of graduate work in an approved school of social work; and (f) at least one year of professional work in a child-guidance clinic, a family agency doing case work, or as a visiting teacher, all under competent supervision.

Another investigation, as applicable to the secondary as to the elementary field, was a questionnaire study reported by Benson and Altedener (4) on the teaching of mental hygiene in institutions for the education of teachers. Only fifty-two, or 21.7 percent, of the institutions offered a fundamental course in mental hygiene; approximately the same number gave special lectures in mental hygiene; the rest included units or incidental treatment of mental hygiene in other courses; thirteen employed a psychiatrist for instruction in mental hygiene. The case method in a teachers' college was described and illustrated by Sperle (21) and the laboratory-training program for guidance workers as offered by Bucknell University was presented by Davis (5a) as valuable methods of instruction.

Secondary-School Counselors and Deans

One of the chief reasons for the scarcity of research material on the preparation of counselors is the lack of agreement on the functions to be performed, apparent in the research material already presented in Chapter III. We must recognize the limitations of the studies already made and those now in progress, for if different conceptions of the functions of counselors are taken in making the investigations, the results cannot be effectively compared. Keeping in mind these limitations, we shall attempt to report studies of two kinds: (a) the qualifications, training, and experience of counselors who are on the job, and (b) the qualifications, training, and experience considered to be necessary by leaders in the field.

Three questionnaire studies of personnel workers in high school yield some information on training and experience. Fitch (6) obtained information from 105 counselors; Bailey (3) obtained answers from 555 of the 966 counselors, deans, and advisers in secondary schools to whom he sent questionnaires; and Sturtevant, Strang, and McKim (25) studied a group of 100 selected deans of girls in 1926 and 90 from the same group ten years later. Of the first group of counselors fifty-four reported having bachelor's degrees and twenty-eight master's degrees; of the larger mixed group only three reported having no degree whereas sixty-one held the master's degree; in the third group practically 100 percent held the bachelor's degree, and in 1936 over half, the master's degree, a decided increase during the decade. More than three-fourths of the 105 counselors had studied psychology, sociology, vocational guidance, and economics. Of these courses, they considered psychology and vocational guidance to be of special value. Almost half had taken a course in labor problems but only seven considered it of special value. The professional courses most

frequently taken by the larger group in Bailey's investigation were principles of education, principles of guidance, tests and measurements, sociology, economics, and adolescent psychology. Of the courses that had been taken, mental hygiene, technics of counseling, and adolescent psychology were judged to be most valuable; principles of education and biology of least value. In the dean's group, eighty-one had taken professional courses in some form of advisory work in addition to the more general courses in psychology and education. Almost 100 percent in Bailey's study had had teaching experience, 85 percent experience in fields other than teaching, 55 percent industrial and business experience, and 50 percent youth advisory experience. Most of the group of deans of girls had had experience as club leaders, camp and playground advisers, and other forms of advisory work outside school. Travel had entered into the experience of nearly all.

Using a modification of Charters and Waples' trait-analysis technic applied in the Commonwealth Teacher Training Study, Jones (9) studied the traits of counselors. This study involved (a) making a duty analysis of counselors, obtained from counselors in service; (b) the collection of conspicuous traits of counselors by interviews with directors of guidance or supervisors of counselors and with principals and superintendents; (c) definition of these traits in terms of trait actions; and (d) evaluation of these by competent judges. Unfortunately, the study did not progress to the point of evaluation. The traits most often indicated in this partial study are breadth of interest, cooperation, refinement, magnetism, and considerateness. These are each explained by the use of trait-action descriptions. Kitson (12) described the duties of vocational counselors, giving in detail the work of one counselor for one day. He also gave some general data on the preparation, the background of experiences, and the areas of courses taken.

A special committee of the Section on Preparation for Guidance Service of the National Vocational Guidance Association, with Jones (7) as chairman, is now engaged in two investigations that may throw some light upon the problem of preparation of counselors. As these studies are not yet completed, only fragmentary reports can here be given. One is an investigation being made by Rachel Dunaway Cox under the general direction of the committee of the Guidance Association and a committee of the Graduate School of the University of Pennsylvania. This investigation is not statistical in nature; it is not an attempt to find by quantitative methods the competencies of all counselors now employed, nor the opinions of supervisors of guidance and those engaged in the training of courses regarding what these competencies should be. It is rather a qualitative case study of personnel workers who are judged successful by at least two competent people. The methods employed are extended personal interviews, group conferences, and questionnaires. At present nearly a hundred rather complete case studies have been made which attempt to ascertain by indirect as well as by direct means the elements of strength and of

weakness in the equipment of the personnel workers. While the results are as yet quite incomplete, there are already merging certain patterns of function, patterns of competencies, patterns of thinking about the job of counseling, and patterns of need which the counselors are discovering in themselves and in their preparation. It seems probable that we shall find not a single pattern that indicates a successful counselor, but different patterns equally good and equally effective in different situations. This should have far-reaching implications for the selection, training, and certification of counselors.

Opinions on Qualifications, Training, and Experience

Many opinions have been expressed as to ways in which the selection, preparation, and certification of personnel workers could be improved. Bailey (3) employed the jury method to obtain a consensus from 147 persons—64 authorities engaged in employing and certifying personnel workers, 35 specialists in the education of personnel workers, and 48 experienced workers. The results of this evaluation are as follows:

1. Personal traits considered essential (these are in addition to traits generally considered essential for all educators: fairness, sincerity, social culture, health, etc.): sympathetic understanding of youth, emotional stability, approachability, broad scope of knowledge and interests, good judgment, and common sense.

2. Essential items of preparation and background experience: previous teaching experience, experience in meeting the public, experience in youth activities outside school, bachelor's degree, and special training in guidance. Internship experience was recommended.

3. Professional courses considered essential: thirty-two courses were listed by counselors as desirable and presented to the jury. Fourteen were judged by the jury to be highly desirable. These were in the following fields: psychology, principles of education, community relations, philosophy of education, tests and measurements, sociology, and mental hygiene.

Other writers and committees have prepared somewhat similar lists of qualifications. Paterson, Schneider, and Williamson (15) prepared a list adapted from specifications proposed by members of the Occupational Research Program, U. S. Employment Service, and by the Division of Rehabilitation, Minnesota State Department of Education. Sturtevant and Strang (25) obtained the opinions of 159 graduate students who had earlier completed a course of professional education for personnel workers and who were then engaged in personnel work. Pierce (16) recommended certain qualifications for women deans and advisers. Fitch (6) obtained the opinion of four trained workers in the field and heads of vocational-guidance departments in certain cities and studied the certification requirements for counselors in several states and cities. Brewer (5) conducted a somewhat similar study. Smith (20), Jones (7), and Keller (11) reported the decisions of three important committees. More objective is the extensive study by Rosecrance (18) of seventy cities in which certain guidance courses were recommended by 634 guidance workers and the results of other studies by Edgerton and himself (10) regarding the qualifi-

cations, experience, and training of counselors. Emphases in these reports are briefly summarized in the following list:

<i>Personal Qualities</i>	<i>Bailey</i> (3)	<i>Paterson, Schneidler, and Williamson</i> (15)	<i>Stur- tevant and Strang</i> (25)	<i>Fitch</i> (6)	<i>Keller</i> (11)	<i>Rose- crance</i> (10, 18)
Fairness	x	..	..	..	..	.
Sincerity	x	.	.	..	.	.
Social culture	x	..	.	.	.	..
Health	x	.	.	.	.	.
Sympathetic understanding of youth	x	.	.	..	.	x
Emotional stability	x	..	..	..	..	x
Approachability }	x	.	.	..	.	x
Friendly }						
Broad scope of knowledge and interest	x	.	..	..	x	.
Good judgment	x	.	.	..	.	x
Common sense	x	..	..	..	.	.
Intelligence } . . . . .	..	x	.	..	x	x
Mental alertness } . . . . .	..				
Vocational interests . . . . .	..	x	..	..	.	..
Personality . . . . .	..	x	..	x	x	..
Leadership . . . . .	..	.	..	..	..	x
Outstanding achievement } . . . . .	.	..	..	..	..	x
Capacity for work } . . . . .	.	..	..	x	..	x
Ability to get along with people . . . . .	..	..	..	..	..	x
Interest in guidance work . . . . .	..	..	..	..	..	x
Good character and wholesome phil- osophy of life. . . . .	..	..	..	..	.	x
Professional attitude . . . . .	..	..	..	..	..	x
<i>Preparation</i>						
Bachelor's degree	x	..	..	x	..	..
Master's degree . . . . .	.	x	.	..	..	..
Ph.D. . . . .	..	.	..	..	..	..
Broad background . . . . .	.	.	..	x	..	..
Teaching experience	x	.	.	x	..	x
Experience in counseling . . . . .	..	x	..	..	..	.
Experience in meeting the public	x	..	..	..	.	..
Social work . . . . .	..	.	..	..	..	x
Experience in youth activities outside school	x	.	..	x	..	x
Experience in working way through college . . . . .	..	..	..	..	..	x
Experience in business or industry . . . . .	..	..	..	..	..	x
Special education in guidance	x	.	x	x	x	x
Travel . . . . .	..	..	..	..	..	x
Occupational research . . . . .	..	..	..	..	..	x
Professional courses . . . . .	.	x	.	..	..	..
History . . . . .	..	..	..	..	x	..
Psychology	x	x	x	..	x	x
Principles of education	x	..	..	..	x	x
Labor problems . . . . .	.	..	..	..	x	..
Community relations	x	..	..	..	..	..
Economics } . . . . .	..	..	.	..	x	x
Social science } . . . . .	..	..	.	..
Philosophy of education or general philosophy	x	..	.	..	x	x
Research . . . . .	..	..	x	..	..	.
Tests and measurements	x	x	..	..	x	x
Health, biology . . . . .	..	..	x	..	..	x
Sociology	x	..	x	..	x	..
Religion and morals . . . . .	..	..	x	..	..	.
Mental hygiene	x	..	..	..	x	..
Counseling methods or techniques . . . . .	..	..	x	..	x	..
Social case work } . . . . .	..	x	..	..	x	x
Social program } . . . . .	..				
Group activities . . . . .	..	..	x	..	..	..
Vocational guidance . . . . .	..	..	x	..	x	..
Vocational education . . . . .	..	..	..	..	x	..

The results of investigation show a great variety of training and experience among personnel workers in service and among the opinions expressed by leaders in the field and committees. To be most valuable such studies should distinguish, first, between personnel workers who are successful and those who are not, and, second, should consider the opportunity to secure adequate professional training. Possibly the very general and diverse nature of the training and experience reported may indicate the impossibility and undesirability of prescribing in great detail training or qualifications for all personnel workers.

The report of the Special Committee of the Section on Preparation for Guidance Service by Jones (7), already referred to, contains preliminary suggestions of desirable guidance elements to be included in the preparation of teachers and of superintendents, as well as of specialists in personnel work. These were formulated by a committee of six representing different positions and responsibilities in the field of guidance. The advice and assistance of counselors, supervisors of guidance, principals, superintendents, state education authorities, and of those engaged in preparation of school counselors was sought in this formulation. It is now in the process of more careful analysis and criticism by a larger group of those concerned. The chief differences between this formulation and most of those previously made are that the qualifications are stated in terms of characteristics, abilities, and competencies of the individual rather than as courses, semester hours, and experiences. General courses are suggested, but the emphasis is placed upon the results of such courses rather than upon the "successful" completion of a certain number of units. The second difference is that in determining the fitness of any individual who engages in or hopes to engage in counseling the "total personality" of the individual functioning in guidance situations should be considered rather than the summation of separate elements.

State Certification

Brief mention should here be made of state certification requirements for counselors and other personnel workers. Bailey (3) made a careful study of state certification. He found that five states require personnel workers in schools to have a teaching certificate with guidance as a major or minor subject. Two states provide special certificates for counselors that are not mandatory, and four states have mandatory counseling certificates. Several other states are making plans for some form of special certificate. These certificates require a bachelor's degree as a minimum and a teaching certificate. In addition, from eighteen to forty semester hours credit in subjects related to guidance are required, sometimes as part of the undergraduate work and sometimes as graduate work. Sometimes these subjects are quite definitely specified; usually only groups of subjects or fields are specifically named. These certification requirements will undoubtedly have great influence in determining the preparation of counselors.

Organized Curriculums

There has been practically no research regarding the organization of curriculums with required and sequential courses for counselors and deans. There are a few colleges and universities which have such curriculums, some of them well defined and organized. In many cases, however, they consist only of courses offered which may be taken in any order and open to teachers, supervisors, and principals, and which are based upon the requirements of the state certificate. This has made it impossible to attempt any valid evaluation of professional curriculums as such.

In considering the development of a real program of professional training for those who expect to engage in guidance service either as teachers or counselors, the suggestion of Strang in Jones' committee report (7) is well worth consideration:

... a teacher-training curriculum, including the extracurriculum, so organized that the students will experience for themselves the processes which later they will want their pupils to experience. In the course of these experiences in classes, clubs, and individual conferences with faculty who exemplify the personnel point of view, prospective teachers (and counselors) should develop socially, emotionally, and intellectually.

Recruitment of Counselors

Little study has been made of the best methods for recruiting prospective counselors. Work along this line has consisted of the statement of prerequisites for beginning the professional courses. The qualities and characteristics necessary for beginning training are usually those for the excellent teacher with emphasis upon maturity, social characteristics, and broad experience. Prediction of success as a counselor is as difficult as that for a teacher. The conditions limiting such prediction of preservice selection are summarized by Sanford (19) as follows: (a) there may be certain qualities that affect teaching that have not been isolated; (b) data for prediction have so far been based upon those who have graduated and are in service—these may not apply to the preservice period; and (c) the period of preservice itself may develop traits and characteristics not found at the beginning of the period.

Preparation of Deans of Women in Colleges

Studies in the preparation of guidance workers in college have been confined largely to a consideration of deans of women. This may be due to the fact that the functions of the deans of women in our colleges are somewhat more clearly defined than those of other personnel officers. Lloyd-Jones and Smith (14) found 166 different titles of personnel workers in college. The deans of women through their national associations have been very active in studying the functions and the qualifications of workers in their field.

Sturtevant and Hayes (23) gathered together descriptions of the work of women deans in colleges and secondary schools which also assist in forming a picture of the pattern of duties and functions of the different types of counselor. Pierce (16) studied the duties and qualifications of deans of women in colleges and made rather specific recommendations regarding their preparation. Sturtevant, Strang, and McKim (25) gathered data regarding the training and experience of deans in colleges and normal schools. The data revealed the following: Eighty-two percent had acquired master's degrees; 20 percent, doctor's degrees. The typical college woman dean in 1936 held the bachelor's degree and had done some graduate work. She had traveled extensively; she had had a variety of teaching experiences. She was apparently well equipped by training and experience to cooperate with other members of the staff.

Jones (8) in her pioneer study of women deans in colleges, while not outlining any curriculum or even naming definite courses for the training of the dean, made certain recommendations. The prerequisites for beginning the professional training are the possession of certain "temperamental characteristics"; a sound liberal education which would include a study of sociology, psychology, and philosophy of education; and a broad experience. "The training itself should consist of subject matter, practice and research related to the duties most commonly performed by deans."

Acheson (1) studied a group of college deans of women who were judged to be successful by personal associates, their presidents, and by a random sampling of students. She obtained from 2,228 seniors statements of specific words and actions of deans which made a favorable or unfavorable impression on them. Personal data were also obtained from the presidents, from the deans themselves, and from the results of measures of personality, emotional stability, adjustability to life, fair-mindedness, social intelligence, and general intelligence. The desirable factors most frequently mentioned were (a) ability to keep abreast of the modern world, (b) a sympathetic attitude, (c) skill in counseling, (d) emotional stability, (e) ability to "think straight," (f) lack of domination in relations with students, (g) a personal interest in each student, (h) a genuine desire to help each individual attain his optimum development, (i) social ability, (j) interest in student affairs, (k) ability to develop a friendly attitude in her office, (l) skill in utilizing student participation in government and in profiting by student opinion, (m) impartiality in dealing with students, and (n) the use of constructive methods in dealing with all student problems. The detailed report of overt behavior of the deans of women that made favorable and unfavorable impressions on students is very revealing. The fundamental importance of such a study of this is evident, for it deals with qualities and behavior of individual deans functioning in actual situations. It does not give specific data upon the value of different courses and experiences in the training of the dean but it should help in formulation of objectives for such courses.

Summary

The survey studies of the opinions of leaders in the field of guidance reviewed show a striking agreement regarding the characteristics, background, training, and experience that are considered to be desirable or necessary. It is difficult to determine whether this agreement is due to a careful study of the successful counselor at work or to an acceptance of the opinions of certain leaders who have set up certain criteria by which to judge the success of a counselor, who have formulated rather definite characteristics, and who have proposed certain types of training and experience. If they are received as tentative statements they are very valuable and constitute the best available basis for the training, selection, and certifying of such personnel workers. If, however, they are accepted as final they will inevitably retard rather than advance desirable professional training.

The studies of Acheson (1), Cox, reported by Jones (7), Strang (22), Sturtevant and Strang (24, 25), emphasizing as they do the qualities, characteristics, and competencies of successful personnel workers rather than the means by which these have been attained, are of great importance and must be taken as basic to any study of types of training and experience.

Needed Research

In general, research in the field of preparation for guidance service has been confined largely to surveys of what is now being done and to the compilation of opinions of those who are considered to be more or less expert in the field regarding what should be the qualifications of workers in the field. These compilations are very helpful, but even they often lack definiteness of purpose and sometimes show poor research technics. Clear thinking and scientific procedures are badly needed. Among the many lines of research that should be attempted, the following may be mentioned as of major importance:

1. Further study of the patterns of abilities and competencies of successful counselors with relation to the situations in which they are functioning.
2. A follow-up study of those who have taken courses in preparation for guidance service to find what types of course and experience has been found helpful.
3. A study of the success of counselors in terms of desirable changes that have been made in individual pupils. This could then be related to courses and experiences of the counselors.
4. An experimental study of the relative effectiveness of different types of training and experience using the control group technic.

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INTRODUCTION

THIS IS THE FOURTH NUMBER of the REVIEW OF EDUCATIONAL RESEARCH which deals with the school plant and equipment. The first number was issued in December 1932; the second, in October 1935; and the third, in October 1938.

It is difficult to identify and choose true research in this field. An attempt has been made in this number of the REVIEW to include material which seems to reflect the essential characteristics of research and also material which seems to have real practical value and which raises problems for further study.

Several differences between the chapter classifications of this number and the one issued in October 1938 will be observed. Subjects on which chapters were included in the 1938 number but do not appear in this number are "Equipment, Apparatus, and Supplies"; "Foreign School Buildings"; "Plant Development for Higher Education, Including Junior Colleges"; "Pupil Transportation Equipment"; and "Status of Research in the School Plant Field." These chapters were omitted in part because it seemed to the Committee that there was not enough new material to warrant including such chapters, and in part because the present chapter organization seemed somewhat more functional than the organization of the previous issue. Possibly in the next issue some of the topics which were included in the 1938 issue but were omitted in this number should be treated again.

The present issue contains chapters on the following topics which have not been previously treated in separate chapters: "The Social Significance of School Plants"; "Some Effects of the Defense Program on School Plants"; "Educational Designing"; "The Legal Aspects of Planning and Constructing School Buildings"; "Furniture and Equipment"; "School Building Bonds"; and "Trends in Construction of School Buildings."

JOHN GUY FOWLKES, *Chairman*
Committee on the School Plant and Equipment

PART I

School Plant and Society

CHAPTER I

Social Significance of School Plants¹

WARD I. MILLER

A REVIEW OF THE MATERIAL available shows that the studies made in this field during the past three years are based largely on current practices and opinions rather than on actual research. Many writers deal with isolated situations only. Reports indicate that important changes in school plant planning are taking place in response to altered social conditions; but little evidence is to be found of thorough investigation back of much of the planning that is being done.

Several outstanding contributions have been made during the past three years. Among these are the Connecticut *School Building Code* (14), *The School Building Needs of Freeport, Long Island* (23), *School Building Portfolio A* (22), *A Rural Area in South Central South Carolina* (31).

Changing Educational Psychology and Philosophy

Engelhardt (17) pointed out the direct relation existing between the newer educational psychology and the school plant. He found that the acceptance of the organismic as opposed to the atomistic psychology has had a marked influence upon plant planning, and that plant development at the present time is based upon a more comprehensive program of education than formerly. In another study (22) Engelhardt presented a checklist for designing elementary-school classrooms based upon the latest research dealing with child development which took into account physical, social, emotional, and intellectual growth. Nichols (44) showed how the school plant should be arranged to contribute to the integration of the pupil's learning. Broome (9) planned the building to permit "learning by doing" and to provide for activities of many kinds. He listed factors in the education of elementary pupils of significance to architects and to those engaged in planning buildings. Garber (32) emphasized the relation of color to the emotional reactions of the individual and presented data showing the color scheme desirable in school buildings. Holmes (34) also emphasized the importance of color and illustrated how its proper use in tile and linoleum contributes to the mental and emotional development of the child. The Connecticut *School Building Code* (14) likewise stressed the importance of color in the educational program.

¹ Bibliography for this chapter begins on page 148

Broader Concept of the Educational Program

Fulcomer (31) analyzed seven objectives he found common to the programs of twenty-two selected communities and showed their influence on school plants. These he listed as (a) encouragement of cooperative effort; (b) development of a "live at home" program; (c) guidance in vocational training; (d) improvement of health education and medical service; (e) preservation of local crafts and industries; (f) provision of recreational facilities to serve all ages and interests; (g) provision of a literacy program emphasizing certain values. Nichols (44) described the manner in which the core curriculum, progressive education, and the integrated program have changed the arrangement and structure of the plant. He presented a "Table of Affinities" which graphically illustrated the relationship that should be developed between units of the building.

Coleman and Opperman (13) described the new vocational and adult school in a midwestern city and presented plans of the building, illustrating the manner in which the vocational needs of the people influenced the type of construction. Horn (36) defined functional planning as "planning for a purpose" and gave many examples of such planning in building programs. Broome (9) showed how the new community school has been planned to utilize local resources and pointed out significant departures in the arrangement of building and grounds. Bennett (5) indicated the changes in classroom seating necessary to meet the trend toward democratic educational practice. Engelhardt (17) advocated the organization of the educational system into four units. The unit for the nursery, kindergarten, and primary children might be called "The Home School Unit." The schools for elementary children might be called "The Neighborhood Elementary School." Those for the intermediate grades might be called "The Community Intermediate School," while the schools which would include the upper two years of the present high school and the two years of junior college might be called "The Regional Educational Center" or "The Youth Center." This plan was recommended in the surveys of the schools of St. Louis and Pittsburgh.

Engelhardt and Engelhardt (24) classified adult activities into five groups, each of which is affecting school plant planning: (a) socio-civic-economic problems; (b) activities related to their homes, home life, personal living; (c) recreation and relaxation; (d) vocational adjustment, readjustment, and advancement; (e) need for functional tools for participation in our society. The Educational Policies Commission in its study (43) of selected high schools found that the introduction of democratic practices in administration and teaching was materially affecting the school plant.

Development of the Community School

Fulcomer (31) reviewed "the need for community education centers arising from the common problems facing secondary-school students and

adults," and reported five areas of community development that could be served by prefabricated units. He listed also the areas of adult education in which public-school buildings could be effectively used. Engelhardt and Engelhardt (24) placed the school at the center of community living and showed how the school plant may be planned to serve community needs. Engelhardt (20) defined the community school in terms of the service it can render. Clapp, in a comprehensive study (12), showed how one community was rehabilitated through its schools. Local resources and needs were made the bases for planning the educational program, and community activities were analyzed. Everett and his co-authors, writing for the Society for Curriculum Study (28), described the manner in which certain communities have adapted their school building programs to meet local conditions. They showed how buildings have been designed to provide training suited to each area, whether it is urban or rural. Their conclusions were based on comprehensive surveys of the regions studied. The techniques that should be employed in making community surveys were also carefully analyzed. Emphasis was placed upon integration of the activities of the school with those of the community which it serves.

In the Seventeenth Yearbook (3) of the American Association of School Administrators, three principles of schoolhouse planning were presented: flexibility, multiple supervision, and multiple use of space. The committee stressed the importance of planning the school plant so that it may be used for community activities as well as for the education of boys and girls. Twelve trends in building construction were presented, each of which has emerged from efforts to adapt the school plant to the communities supporting it.

Social Changes

Several studies dealt with the effect of certain social changes upon education and the school plant. They included investigations of shifts of population, birth-rate decline, economic conditions, urban decentralization, community rehabilitation, and reconstruction of rural life. Carr (11) presented three major trends in population growth that have direct influence upon school building programs and plant planning: (a) a change away from the rapid population growth of earlier decades and toward a stationary or possibly a decreasing population within relatively few years; (b) general movement of the population away from farms; (c) decline of the proportion of the population under nineteen years of age with an increase in the proportion over forty-five years of age. School building programs of the future will be conditioned by (a) continuing pressure of the population above the elementary school and demand for school services at successfully higher age levels, and (b) new programs and procedures adapted to the needs and expressed desires of persons of all ages. Specific conclusions were drawn with reference to the elementary and secondary schools as well as to colleges and universities.

Cartwright, in his introduction to Engelhardt and Engelhardt (24), emphasized the effect of changes in population on plant planning, as did also the authors of this important study. Engelhardt (23) in the survey of the schools of Freeport, Long Island, New York, showed how population changes have altered the building program in this community. The same method was used in the study (25) of the South Kingstown, Rhode Island, system. This factor was also emphasized in Engelhardt's list (19) of social factors affecting building programs, namely, population changes, urban decentralization, community rehabilitation, and educational programs for handicapped children. Fulcomer (31) and Moehlman (41) likewise found that population changes have altered materially school plant construction and operation.

Engelhardt and Engelhardt (24) determined that important changes in school plant planning and construction were necessary if the needs of out-of-school, unemployed youth and adults were to be served. They cited examples of building programs designed to take care of increased enrolment and other important changes in modern secondary-school student bodies. Fulcomer (31) showed how the need for guidance of youth and adults in vocational training has changed the equipment of school shops.

In the surveys mentioned, emphasis was placed upon the need for accurate information regarding a community and its youth before those responsible can proceed in the development of a building program. Engelhardt and Engelhardt (24) pointed out the changes that have been brought about because of urban decentralization. Loss of students and the changed character of city communities, as well as new developments in suburban areas, were shown to affect markedly particular school building programs. Both Engelhardt and Fulcomer in the studies cited above presented important data regarding the types of schools developed in communities rehabilitated in recent years. Clapp (12) showed how one school program was developed from the economic and social needs of a particular region.

Important changes in the school building programs of rural areas were reviewed by several writers. Bursch and Early (10) analyzed the conditions found in rural communities and schools in California, and showed how these have affected plant planning. Broady and Stoneman (8) found how consolidation of rural districts resulted in the development of the twelve-grade school building designed for multiple service. Niles (45), in his study of 25,000 WPA school projects, found that "the trend has been definitely toward the building of consolidated schools to replace . . . one room schools." In an outstanding survey of local school units in ten states, Alves (2) determined the factors which have affected the organization of local units. He presented valuable data regarding the number, size, and standards of rural schools in the states studied and proposed important changes in school plant planning. Seven specific

procedures were recommended. Holy (35) made a similar study in Ohio as did Credle (16) in North Carolina.

Planning School Plants for Social Purposes

Significant studies made recently emphasized the need for community service and the determination of educational objectives prior to the actual designing of sites and buildings by the architect. The Connecticut *School Building Code* (14) presented eight serious errors found too commonly in plant planning, two of which are pertinent to this study, namely, commencing the design of the building before educational and community needs have been clearly determined in detail, and undertaking a building project in the absence of a comprehensive and well-defined future building program. The survey has become recognized as one element of good school planning. The need for comprehensive building programs rather than isolated projects was suggested in a number of important studies.

Engelhardt and Mort (25) presented an example of an accurate and detailed community survey, and developed information sheets for parents, other citizens, and teachers. Zisman (56) showed how one community carefully analyzed its needs before planning its vocational plant.

The Connecticut *School Building Code* (14) found seven specific steps to be necessary in the conduct of a building program. Engelhardt and associates (22) prepared an extensive checklist for elementary schools, together with plans of classrooms selected from each state. Each plate carried a floor plan, an elevation, and a detailed drawing of special features of each classroom, or their equivalent. Other portfolios are in process of preparation which will deal with secondary-school classrooms and with special rooms.

Engelhardt compiled also (21) checklists covering all phases of plant planning—sites, equipment, instructional units, and so forth—which were prepared by his students under his direction over the period 1930-1941. The working drawings and detail of material presented should prove of great value to boards of education, administrators, and architects. Fulcomer (31), Clapp (12), and Everett (28) studied specific communities and reported the planning back of the school plants visited. Long-range planning was described by Miller (40), Bursch and Early (10), and Haydis (33), and examples presented of outstanding building programs.

Cooperative Planning

In recognition of the social significance of the school plant, cooperative planning was reported in several important studies. Local projects were found to be directly related to state and national programs. Niles (45) reported many instances of cooperation of local school units with other governmental agencies. Skinner (51) showed how effective the cooperative planning of governmental agencies can be. Long (39) pointed out

the necessity for long-range planning, especially in relation to federal aid. In his comprehensive survey, Fulcomer (31) described the school building programs cooperatively developed in the communities studied. Covert (15) showed how the huge program of school construction planned in Pennsylvania will be coordinated between local and state agencies. Engelhardt (17) also showed the need for coordination of school plant planning and city planning.

The *American School and University* in its thirteenth annual edition (4) brought up to date its survey of state departments and showed the part each of the forty-eight commonwealths is prepared to play in school building programs. The state of Washington (55) reported a thorough study of its common schools and presented important recommendations for greater adaptation of school plants to community needs. Haydis (33) made the same type of investigation in California.

Changing Standards To Meet Social Demands

A review of the research carried on during the past three years indicates that standards of school plant construction are changing in response to social requirements. Zisman (56) advocated that the buildings described should not last longer than the life of the bond issue. Fulcomer (31) and Abramovitz (1) found that beauty in the school plant has an important influence on community life.

Accessibility was stressed by Coleman and Opperman (13) and by Engelhardt and Engelhardt (24). Adaptation of the school program to the changing life of the community was surveyed by Mort and Cornell (42) in an important study of the schools of Pennsylvania. Nine adaptations were measured, each of which had important implications for the school plant. Alves (2) presented data concerning the schools of Tennessee in relation to this standard. The Engelhardts likewise stressed adaptability, together with flexibility. All of these investigators emphasized the functional character of the modern school plant. It must be designed to perform efficiently the purposes for which it was developed. Each part must make its specific contribution toward the common end. Engelhardt, in his portfolio (22) of elementary classrooms, presented many examples of functional planning. Fulcomer (31) likewise showed how a number of communities had planned their school plants to serve the needs determined through surveys made previously. Coleman and Opperman (13) illustrated the manner in which a building may be designed to care for the vocational needs of a city.

Sites and Community Needs

The Connecticut *School Building Code* (14) established standards for school sites in relation to community needs as well as to those of the regular educational program. The use of school grounds for community recreation was strongly recommended, and should be included in planning

the program. Engelhardt and Engelhardt (24) presented working drawings that indicated the manner in which school grounds may be planned and developed to serve effectively educational, social, recreational, and cultural purposes. They found that the most desirable sites for community schools should include from twenty-five to one hundred acres. They presented standards regarding area, parking spaces, landscaping, play fields, water areas, picnic grounds, natural theaters, nature crafts, gardens, and farms. Broome (9) also studied the site as a community resource. Strippling (53) developed in an unusual manner the site for a large high school in one of the southern cities. Bursch and Early (10) studied sites for rural schools in California and showed the possibilities of intelligent planning. Zisman (56) described the program of site development as worked out for a large consolidated school in Texas.

Planning Units of the Building for Community Purposes

A new term has found its way into the literature dealing with school plant planning. Authorities in this field have employed the term "unit" or "suite" when speaking of the section of a building devoted to particular uses. The Connecticut *School Building Code* (14) presented standards for the "art unit," the "gymnasium unit," and the "shop unit." Those units most commonly used for community purposes were found to be the auditorium, gymnasium, cafeteria, library, locker rooms, recreation field, and the health service units. In planning for use of the building for adult education, convenient access should be provided for the shop unit, the homemaking unit, the commercial unit, the science laboratories, the music unit, and the art unit.

Engelhardt (21) developed plans of these units to care for forums, discussion groups, conferences, dramatics, art and music centers, as well as for the subjects commonly taught in the regular school program. Engelhardt and Engelhardt (24) studied the entire school plant from the viewpoint of community needs and services. A valuable compilation was made by the Office of Education (29) covering the planning of rooms for certain activities to be undertaken by the community high school. The areas of activities studied were the exact sciences, the social studies, the fine arts, libraries, gymnasiums, and play areas. Recommendations were presented covering space, equipment, and orientation. Fulcomer (31) included no working drawings but critically analyzed the facilities required to serve community needs.

Reed (48) pointed out that "the auditorium has become the focal point, a center of interest for the entire community as well as an important factor in its civil life." Viles (54) recommended placing auditoriums and gymnasiums near or at the ground level to facilitate handling large numbers of people. The Connecticut *School Building Code* (14) recommended that the requirements of the school program and the nature and extent of community use of the auditorium should determine its seating capacity.

The auditorium unit as conceived by Engelhardt and Engelhardt (24) includes workshops and laboratories for use in work associated with the stage. These authors presented a much broader concept of the auditorium as a part of the school plant than has been commonly expressed. The shop, homemaking, and recreational units likewise were planned in terms of functional arrangement, use, and location. A "suite" of laboratories comprised these areas, each designed to serve specific purposes. A checklist for secondary-school shops prepared by Peterson and Bartholomew (47) was designed to include standards for community use of these facilities. Palmer (46) developed plans for homemaking units which included all types of rooms found in the average American home.

One of the important factors in the complete utilization of the school plant is that of the transportation of pupils. It is of great significance in a study of social services provided by the school plant. A comprehensive review of transportation problems and trends was reported by Lambert (37).

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CHAPTER II

Procedures for Determining School Plant Needs in Social Terms¹

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IN PREVIOUS ISSUES OF THIS REVIEW, subjects related to the topic of this chapter have been treated. Smith, in the December 1932 REVIEW, reported on the survey preliminary to a school building program. Wilson, in the October 1935 issue, reported on the technics for determining housing requirements in elementary, junior, and senior high schools, and Arnold, in the October 1938 issue, treated the technics of school building surveys. The topic of this chapter is more specific. Comprehensive discussions of technics and procedures for determining school plant needs appeared in Engelhardt and Engelhardt's *Planning School Building Programs* and in Moehlman's *School Plant Program*. Since April 1938 some new practices have appeared in literature.

Community Analysis

A searching community analysis is thoroughly in line with *The Purposes of Education in American Democracy* (46) and more specifically is it in accord with the objectives of education as stated by this commission (46: 45-50). Education can fulfil its functions only to the extent that educational and community leaders are aware of the needs of all the people in the community. Goodykoontz (30) stressed the importance of the community as to size, location, history, people, making a living, community organization and government, health, recreational and cultural opportunities, housing, and welfare services. Brunner (5) emphasized a knowledge of the population, origins and culture, economic status, health, recreation, and housing. He gave the sources for many data, stressed the importance of local organizations, and showed the possibilities of the social survey. Colcord (11) gave a comprehensive outline for making a survey of a community to determine its provisions for health, education, safety, and welfare. Engelhardt and Engelhardt (19) showed the importance of studying the needs of all the people of the community and then constructing the community school to serve these needs. Engelhardt (18) showed that volumes on city planning had failed to give due consideration to school building needs. Engelhardt (18) showed that school plant needs must be reconsidered in the light of other community factors.

Thorndike (62) rated 310 American cities with populations above 30,000 (1930 Census) on 297 recorded traits. Fifteen of the cities were dropped because of incomplete data. Since he was interested in measuring "the

¹ Bibliography for this chapter begins on page 158.

goodness of life for good people in a city," he selected thirty-seven traits which, in combination, he believed had significance as an index of "goodness," giving each trait a weighted value. He then rated the cities according to their G score (quality of goodness) and ranked them from highest to lowest. By the use of correlations he determined the factors which influenced the G scores of cities. He found that personal income and personal qualities of the citizens accounted for about 85 percent of the differences between cities. He estimated that if perfect measures of every fact about these cities and their inhabitants were available, the differences among the 295 cities in the goodness of life for good people would be attributable to these factors (66: 117): about 60 percent to differences in the mental and moral qualities of the populations; about 3 percent to differences in their physical health and energy; about 25 percent to differences in their incomes; about 2 percent to differences in the works of previous generations (other than giving birth and training to the present generation); about 5 percent to differences in the work of government; about 1 percent to differences in homogeneity of race and culture; and about 4 percent to causes at present unknown. He advocated improving cities by "more good people"—high birth-rates of the people with the best qualities, better education, and less dependence on political reform. The work showed the limitations of formal statistical technics in dealing with social data, but undoubtedly educators will find these technics fruitful in making an analysis of their own city.

Thorndike (63) followed this study by an analysis of 144 cities with populations between 20,000 and 30,000, using the same sources of facts and the same technics.

The survey of the Pittsburgh public schools (59) was the first school survey to use technics similar to those used by Thorndike (62). The Pittsburgh Survey developed indices for testing variation in school plant needs, and applied them to the environmental and social conditions of each of the 188 census tracts in the city of Pittsburgh. Thirty-eight factors were used in making the indices, with weightings being given by the survey staff. Some of the conclusions were that the movement of population out of areas which have less desirable environments is a slow process; school buildings and educational facilities are poor in these sections since they are old sections of the city; the poorest environmental sections are most dependent upon education; such areas must be given the best of educational facilities including adequate buildings and sites; and in the light of the findings it is definitely undesirable from the point of view of either economy or efficiency to standardize school building design, since buildings must be designed to meet the specific needs of each school neighborhood.

Engelhardt (24) pursued the problem as revealed in the Pittsburgh Survey (59: 439-44) still further. He found that neighborhoods with poorest environmental conditions had the poorest school facilities and the most inadequate playgrounds; the poorest districts had almost twice as

many children of school age as the best neighborhood; but in 1939, the number of high-school graduates from the poorest was only half that of the best, indicating a serious problem in equalization of educational opportunity at the secondary-school levels; that the population density in the poorest area was three times as great as in the best area; and that health conditions were much worse in the poorest area than in the best area. For example, diphtheria mortality in 1934 was four times as great in the poorest area as in the best area, and the infant death-rate was twice as high. Variations in economic levels between poorest and best areas showed a ratio of seven times for average monthly rent, ten times for number of passenger cars purchased, and thirty times for proportion of overcrowded dwellings.

Comparisons of the enrolment of adults in evening classes were made with the environmental indices. These findings were: (a) neighborhoods having extremely favorable environmental and social conditions were not represented in the adult classes; (b) in neighborhoods with very poor environmental and social conditions a large proportion of the adult population attended both the vocational and recreational programs; (c) the neighborhoods which fell in the median group showed the greatest demand for cultural courses. This group also developed heavy attendance in the recreational programs.

The Department of Reference and Research, Board of Education, Newark, N. J., recently completed a community analysis for use in educational planning (47). The technics employed were similar to those used in (30) and (24). A notable feature of this work was the wide use of community organizations and agencies in gathering the data, under the guidance of research experts.

Some of the educational conclusions were: (a) Measures must be taken in educational planning to assure increased opportunities for children, if the city of Newark is to attract young families and thereby maintain itself as a balanced residential community. Such planning should include modernization of school buildings, greater provision for recreation, reduction of class size, expansion of educational opportunities, and improvements in curriculums and teaching. (b) Money saved through curtailment of building and recreational programs is offset to a large degree by migration of young families away from the city to find better opportunities for their children in other communities. It was found that the distribution of juvenile delinquency cases corresponded very closely with the distribution of youth fifteen to eighteen years of age not in school. Much thought should be given to the possibility of increasing educational and recreational opportunities for youth not now in school. The solution may be found in variation of high-school programs to meet the differentials in needs and wants of youth according to their social and economic status, providing wide work experiences.

Scates (55) reported three methods for deriving an economic index for census tracts or other areas in cities. These technics might profitably

be used in connection with comprehensive community analyses, such as the one reported in (47), not only for aiding in determining school plant needs but also for determining the ability of a community to pay for the school plant needed.

Many writers have advocated the social survey as an important means of determining school plant needs. Skeen (61) showed that administrators were likely to ignore the social viewpoint, but that plant needs cannot properly be determined without accurate knowledge of the whole community. He advocated the social survey embracing much the same features as (11) and (30). The job is a continuous one. Miller (40) considered long-term planning most essential to successful administration. He advocated wide use of citizen groups not only to assist in surveys but also as an advisory organization on educational matters and as a clearing-house for information to the community. He reported (39) a satisfactory and successful procedure used on his own city which was comprised of (a) publicity showing needs for a survey, and (b) study of community plant needs. An organization was set up, including representation from the state planning commission, city council, city planning commission, board of commerce, other community organizations, principals, teachers, and supervisors, aided by an educational consultant from the state university; (c) curriculum study under a curriculum director—teachers acted as a planning and coordinating council, with committees from industry, citizens, and pupils; (d) then followed the planning of the new high-school plant to fit community needs; (e) the public was informed by three committees of twelve members each, on means and methods of financing, on plant needs, and on student education and welfare. Wide community participation was an educational experience of the highest order for the entire community, resulting in a wider vision of education.

Zisman (68) reported the experiences of another community which considered the planning and construction of its school plant as being the most important responsibility of the citizens of the community. Malan (36) reported the experiences of a class in Indiana State Teachers College, studying the community from which the pupils of the million-dollar laboratory school came.

Fulmer (28) wrote up the findings of an analytical study of a rural school area which covered 115 square miles, composing ten school districts in western Picking County, South Carolina. Fulmer followed with a study (29) of another rural area in South Carolina, using the same procedure. The findings were quite similar, further emphasizing the need for a dynamic, functional educational program in solving the mammoth problems in these rural areas. The school plant must be constructed to serve the needs of all the people, both young and old. The improvement of rural education thru consolidation and other reorganization of school districts in order to serve the whole population better was recognized in (2, 21, 34, 45, 52). The National Council on Schoolhouse Construction (44: 81-82) emphasized adequate sites for both urban and rural schools

if the school plant is to serve modern educational needs. A new procedure for using sites for wide, meaningful work experience was suggested in (21).

The St. Louis Survey (60), the Pittsburgh Survey (59), and other studies (2: 30-31; 1; 9; 14; 17; 19; 21; 22; 25; 27; 41; 52) recommended a wider and more functional curriculum. They advocated providing a school plant which would adequately meet the needs of all ages in the community. Such wide uses of the schools as true community centers will cause education to become a powerful agency for the "good life" in America. Clapp (9), Engelhardt and Engelhardt (19), Fulcomer (27), Mitchell (41), O'Leary (49), and Engelhardt (14) have described community centered schools which meet the needs of all the people to whom the schools belong.

Housing Conditions and Their Relation to School Plants

Education is greatly affected by housing conditions. Slum areas create many anti-social problems which educators must attack and aid in solving. The Pittsburgh Survey (59) was the first attempt, in a school survey, to analyze the problem. It was found that the poorest housed sections of the city had the poorest school facilities, including unsatisfactory playgrounds. This survey advocated the best of school facilities in the poorly housed areas. The Pittsburgh Survey also indicated a close relation between housing and the type of education which should be offered. The studies by Fulcomer (28, 29) indicated that the poorer the type of houses and home conditions, the more the community becomes dependent upon education. In Pittsburgh it was suggested that it might even be necessary and desirable to establish schools and camping grounds in the open country for pupils from the slum areas. Providing better school plants and better housing can undoubtedly save great expense to society in preventing crime. Most youth would prefer a good school with ample provisions for recreation as his headquarters to the "den" where he often starts on his road to crime. Providing superior school facilities for a neighborhood will do more good if the school is widely used as a community center for both children and adults.

Perry (50), Heydecker and Shatts (32), Engelhardt and Engelhardt (19), and Engelhardt (18, 15) have shown the necessity of correlating city planning with school plant planning. Perry has long insisted that the best way to plan a neighborhood is around an elementary school, with its plant facilities and provisions for a community center. Flanders (26) also reported a close relation between low-rent housing and educational problems. Engelhardt (23) unexpectedly found that home ownership contributed to child migration in Pittsburgh. He did not profess to know the reason for this, but suggested that it might have been due to the depression or changing economic status of the family. Wenzel (65) proposed a plan for elementary-school facilities in certain low-rent housing projects in Pittsburgh. Thorndike (63) was so convinced that home ownership was

desirable that he said, "The leaders in a community may safely encourage home ownership almost without reservation." Home ownership depends on foresight and prudence rather than income (63: 61). Buttenheim (6) suggested some of the things that educators might do about housing. Clark (10), Mason (37), Cary (8), and Wood (67) insisted that housing should be a part of the curriculum from the kindergarten to the university.

Residential Saturation of Communities

A comprehensive community analysis should include a study of residential saturation. The Pittsburgh Survey (59) and the study made by the Department of Reference and Research, Board of Education, Newark (47), considered the density of population in studying the environmental conditions of Pittsburgh and Newark. Thorndike (62) and (63) also considered density of population to be an important factor in determining the "goodness" of a city. Engelhardt and graduate students showed the educational changes taking place in a community as residential saturation increased (20).

Effect of Changes in Population

The planner of school plants needs to know much more than the number of pupils of the various age groups for whom facilities must be provided. He must analyze the social and economic forces and other factors which determine the number, race, and condition of the children and adults to be served, the environment which the school plant is supplementing, and further, how the school plant and program may transform that community into a more satisfactory living space. Engelhardt (15, 17), Engelhardt and Engelhardt (19), Fulcomer (27), and others developed the subject of functional planning in terms of present and projected needs for community betterment.

Carr stated that the demand for funds for plant facilities for elementary schools would not decrease in proportion to the child population due to such factors as the tendency to lessen pupil-teacher ratio, the inclusion of provisions for nursery schools and health services in an expanding school program, wider community use of school facilities, the shifting of residences within cities—from urban to suburban areas and between sections of the country. Carr (7), Baker (3), and Russell (54) found that the secondary schools are likely to maintain their attendance levels for some years longer. New buildings adapted to a broader secondary-school program will be needed. School programs and plants adapted to the needs of all the children and the community will raise the ratio of the school enrolment to the total school age population. Harvey (31) listed several factors to explain the tardy response of school enrolment to population shifts. A study under the direction of the National Resources Committee presented significant data in regard to population trends and discussed

major problems related to human resources in a report published in 1938 as *The Problems of a Changing Population* (64). Comprehensive summaries of population trends and studies of their implications for child welfare, public health, social security, and education were made before the Eighteenth Annual Conference of the Milbank Memorial Fund held on April 2 and 3, 1940, and later published (38).

Many studies based on census facts have stressed the implications for education in the wide disparity in the distribution of children of school age and the ability to furnish educational advantages. Smith (57) noted that the standard of living and birth-rate were in inverse ratio. Newton Edwards (12) found that our national educational policy should be reshaped in the light of the fact that high fertility has been co-existent with low planes of living, restricted income, low cultural and intellectual status, and inadequate educational facilities. Whelpton (66) stated that the 1940 Census indicates that the slowing up of population growth is not affecting the schools serving rural areas. The rural growth actually rose during the first half of the past decade, although the increase was far from uniform throughout the country.

Mobility and migration—Baker (3) noted that the uncertainty of our knowledge of where people will live, associated with prosperity and depression cycles, and the increase in the relative percent of the teen age population in the secondary schools, require further study in order to anticipate shifts and furnish a meaningful program to all youth. The mobility of our population both within and between school districts, cities, and states offers problems in the provision of building facilities and in supplementing the educative and miseducative features of the environment for children up-rooted from stable homes or continually moving from place to place. The survey of the schools of the Miami area (42) dealt with the problem of seasonal fluctuations in enrolment in schools serving tourist families. Kirkendall (35) discussed the problems of the changing enrolment in boom towns and the effect of roving upon the children. An editorial in the *Elementary School Journal* (13) stated that the largest absolute increase in population comes from the groups of inferior economic resources. The fact that the reservoir of future population of cities and industrial regions is to be found in areas where incomes are meager and the load of dependent children on producers is twice that in more favored regions is of social significance, not only in relation to the rights of the children in these areas to educational opportunities but also to the areas in which they will live as citizens and producers.

Increasing age—Ogburn (48), Smith (57), and Israeli (33) commented on the psychological changes which may characterize a population with an increasing ratio of elderly people to the total population. Smith (56) stated that any expansion based upon "booster" psychology is out of date. Rapid increases in real estate values generally can no longer be expected. The tone of the population is likely to become more conservative. The average age of workers will increase. Technological changes and variations

in consumption will make it necessary to provide for retraining of workers whose occupations become obsolete. Many will wish educational opportunities for cultural and civic as well as vocational improvement. Russell (54) predicted that a greater percent of the population would attend school a longer period of time and that the quality of the school product would improve.

Expanding Needs for Education

Engelhardt (18) stated that the effect of the decreasing birth-rate would not be expressed in fewer schoolhouses but in educational buildings being adapted to the population which exists, and which, "in all stages of life, will feel the necessity of educational growth." The activities of the school, the city, and the other service agencies should be planned together upon the basis of demographic and sociological studies to provide school, park, and playground centers for community needs.

Smith (57) was among the number who commented upon the necessity for social institutions to concern themselves with the inter-relationships of the newer social trends—with the whole conception of social planning—because of the competition of age with youth for public funds. Israeli (33) believed that our old age population would require something more than care and sympathy. Education would be required to find something for them to do. Punke (51) felt that the schools should provide work training and experience to overcome the psychological effect of unemployment upon the morale of youth between the ages of sixteen and twenty-one. Fulcomer (27), Engelhardt and Engelhardt (19), and the report of the Kingston school survey (21) indicated ways in which high schools over the nation are being used to expand community interests and improve the goodness of life for people of every age.

Even though the general trend in the country indicates a decreasing school population, there will be individual communities, such as those in suburban and resettlement districts, in which the reverse is taking place. Engelhardt (20) interpreted the trends in such a community where metropolitan decentralization results in the influx of young families who are patrons of the elementary and junior high schools. Joyal (34) found a similar condition of growing population in an area affected by the increasing activity in the national capital. The report discussed methods for forecasting future population. The adequacy of the school program was evaluated in the light of a social analysis of the region, the withdrawals from high schools, and the study of the status of alumni of the schools.

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CHAPTER III

Defense Program and School Plants¹

H. F. ALVES

THE EXPANSION OF EXISTING and the creation of new Army, Navy, and industrial establishments, with the resulting concentration of population in hundreds of places throughout the country in carrying on activities essential to the national defense, has brought to the fore many problems of planning and providing services never before experienced by American communities. With many communities doubling in population and with the building of entirely new towns and cities, transportation facilities and the usual governmental services, if available at all, have proved to be inadequate. Many serious problems are simultaneously confronting us in connection with the provision of facilities necessary to community life. Activities of the federal government in its defense program have caused an unprecedented migration of personnel to Army, Navy, and industrial establishments. In many of the localities experiencing this defense impact, essential community services are not available. Our attention has quickly been drawn to the fact that these essential community services cannot be made available by state and local governmental entities. The federal government has found it necessary to lend its assistance.

Preliminary Study of School Needs

In the early stages of development of the program for national defense, the need for family housing facilities was recognized by Public Law 849 (76th Cong.) (4). This act also recognized the need for "community facilities" by a limited provision setting aside for such facilities, including schools, an amount not to exceed 3 percent of the appropriation. Senate Resolution 324 (76th Cong.) (5) called upon the Secretary of the Navy and the Secretary of War "to make a full and complete study and investigation of all school facilities at or near naval yards, Army and naval reservations, and bases at which housing programs for defense workers are being carried out or are being contemplated." Three questions were asked relative to these areas, namely, (a) whether such housing programs would necessitate additional school facilities; (b) whether the communities adjacent to or near such reservations and bases are financially able to provide such additional facilities if needed; and (c) whether the federal government should provide such additional facilities, irrespective of the financial ability of the community.

Following requests from the Secretary of the Navy and the Secretary of War for the U. S. Office of Education to make the study called for by Senate Resolution 324, plans for the study were formulated with the

¹ Bibliography for this chapter begins on page 166

assistance of interested federal agencies and state departments of education. On January 21, 1941, the U. S. Commissioner of Education filed his *Report on School Needs in Defense Areas* (2, 13). This report shows that there is an imperative need in many localities for school facilities to accommodate children of personnel connected with activities essential to the National Defense Program and that many local school administrative units faced with the problem of providing immediately school plant facilities and teachers for a large number of additional children of school age are without authority to obtain through regular channels additional funds for these needs. Local school administrative units in common with other local governmental entities must conform to legal limitations regarding maximum bonded indebtedness for school purposes and the maximum local tax on property that may be levied (a) for interest on and reduction of bonded debt, and (b) for current operating expense.

Reports of estimated needs submitted to the U. S. Office of Education during the first four months of 1941 showed that the anticipated influx of personnel to be connected with activities essential to the National Defense Program was expected to bring into these areas approximately 300,000 children for whom adequate school facilities would not be available. In his official report (13) the U. S. Commissioner of Education recommended the following plan for paying the cost of school needs in defense areas:

1. For children residing on *public* property the Federal Government should bear the cost of required capital outlay and current expense except that when such property is liquidated, a pro rata part of the cost should be assumed by the local school administrative unit or units involved.

2. For children residing on *private* property *not subject to immediate taxation* the Federal Government should lend to the local school administrative unit the required funds for capital outlay and current expense that cannot be derived locally until the property in question appears on the tax rolls, except that during the non-tax-producing period the Federal Government should pay, in lieu of taxes, its pro rata part of the current expense.

The House finally adopted H. R. 4545 (7) with Senate amendments and the Senate accepted it on June 27, 1941. H. R. 4545 authorized the appropriation of \$150,000,000 for "public works," including schools, and became Public Law 137 (77th Cong.) (8) and funds to implement its provisions were made available.

Administration of Public Law 137

Applications for federal funds authorized under the provisions of this Act² are filed by local school authorities through the regional offices of the Defense Public Works Division of the Federal Works Agency.³ Priorities are set up in a region with the assistance of a committee composed of the regional directors of Defense Public Works and of the Office of Defense

² An authorization of an additional \$150,000,000 for community facilities, including schools, was provided for in Public Law 409 (14) on January 21, 1942.

³ The administration of Public Laws 849, 137, and 409 is in the hands of the Federal Works administrator (1, 4, 8, 14).

Health and Welfare Services, and representatives of the National Resources Planning Board, state planning boards, and defense councils, as well as of education, health, and recreation. Applications are forwarded by the regional directors of Defense Public Works to their Washington office for final review. Applications relating to and involving requests for funds from this Act for school facilities are submitted to the U. S. Office of Education for "certificates of necessity" which serve as bases for approval or disapproval of projects applied for. Final action—approval or disapproval—is recommended by the Bureau of the Budget for the President.

Determining Needed School Facilities in Defense Areas

The need for additional school facilities in defense areas is changing from day to day and thus can be known only through firsthand knowledge acquired through field work. To assist local and state educational authorities in determining the adequacy or inadequacy of existing school facilities in defense areas, the U. S. Office of Education has a staff of Senior Specialists on School Facilities working out of the offices of the twelve regional directors of *Defense Health and Welfare Services*. When visiting a local area for the purpose of determining actual school needs because of the defense impact, these representatives of the Office of Education are accompanied by representatives of state departments of education. Every possible effort is put forth in this field work to attempt to project additional physical plant facilities in accordance with current practices in the locality and in the state and in accordance with long-range plans. The ability and effort of the respective local school administrative units involved, as well as the existing legal limitations relative to assumption by these units of additional obligations for capital outlay purposes, and other similar factors are considered. Obviously this program of evaluation also takes into consideration available funds for school purposes from all regular sources. Possible state emergency aid is a factor in several states.

Within a given defense area, involving in some instances a number of local school administrative units, the inadequacies in a given unit may often be overcome by greater utilization of facilities within this unit and in adjoining units. Reassignment of pupils and rearrangements of schedules within and without a given local unit, in some instances permit the accommodation with existing facilities of an appreciable influx. Within existing legal limitations and specifications, transporting pupils to schools in adjoining local school administrative units is generally relied upon as an emergency measure by state and local school authorities.

If the aforementioned plan for greater utilization of existing facilities does not permit accommodation of all the increased enrolment, provisions by administrative units, involved in a given defense area, for increased school housing facilities are projected in terms of (a) bringing into use buildings abandoned during the recent past because of reorganization pro-

grams; (b) rented, donated, or improvised quarters; (c) alterations of existing buildings; (d) additions to present plants; and (e) construction of new buildings.

Whenever additional funds are required which cannot be made available from existing local and state sources, funds from Public Law 137 are usable on the basis of the actual need chargeable to the defense impact. In those local school administrative units in which defense family housing units have been provided with funds from Public Law 849, payments in lieu of taxes may be made during the year. Section 9 of Public Law 849 states:

The Administrator may enter into any agreement to pay annual sums in lieu of taxes to any State or political subdivision thereof, with respect to any real property acquired and held by him under this Act, including improvements thereon. The amount so paid for any year upon any such property shall not exceed the taxes that would be paid to the State or subdivision, as the case may be, upon such property if it were not exempt from taxation.

It is obvious that such payments of "annual sums in lieu of taxes" will in no instance be sufficient to provide for defense-connected children school facilities and services provided for children residing in the locality preceding the emergency. There is thus an urgent need in numerous defense areas for federal financial assistance for current operating purposes as well as for physical plant and transportation facilities.

Some Effects of the Defense Program on School Plants

Early in the development of the program of activities essential to the national defense, it was recognized that there would be an acute shortage of workers required for these activities. To overcome this shortage and to prepare for anticipated needs for such workers, there was instituted more than a year ago a program for the education and training of defense workers. Public Law 146 (9, 11) makes available federal funds for carrying on in schools, colleges, and universities for the training and retraining of urgently-needed workers essential to the national defense. Federal funds are thus made available from Public Law 146 for (a) costs of instruction; (b) purchase of essential equipment; and (c) for rental of quarters required in connection with the Defense Training Program. School facilities which lend themselves to carrying on this program are being used in numerous instances 24 hours in the day. Even with this increased utilization, existing plant facilities are proving inadequate in a number of defense areas in which needed quarters cannot be rented because none are available.

In numerous instances state and local school authorities have continued to emphasize long-range planning begun years ago. This means that school plant facilities required because of the defense impact to accommodate the influx have been and are being planned with the same care as programs of expansion preceding the emergency.

One of the most difficult factors to be considered in this program relates to the temporariness or permanence of the required school plant facilities.

Whether or not these school facilities required because of the defense impact will be needed after the emergency is dependent, in part at least, upon the temporariness or permanence of defense establishments—Army, naval, and industrial. The use after the emergency of the family housing facilities now being provided by public and private capital for personnel necessary for the operation of these establishments is dependent in some areas upon the continuance of these establishments and in others upon their absorption into the locality housing program.

It is now known that if all acute needs are to be provided, additional funds will be required. Although no definite figures are available, it is estimated that not more than one-half of the acute school needs can be provided with available funds. Applications filed with the Federal Works Agency, Defense Public Works Division, indicate likely needs for funds aggregating two to three times the existing appropriation.

Bibliographical Note

Many of the materials of value in pursuing this topic are not available for general distribution. The hearings before the Congress on the several community facilities bills, and Congressional documents and reports were not printed in sufficient quantity for wide distribution and are in general out of print. The files of the U. S. Office of Education contain data on and surveys of actual school needs in defense areas and individual school administrative units affected by activities of the federal government's war effort, but these official documents *are not available* for general distribution and use. Copies of the several acts authorizing the appropriation of federal funds for community facilities, including schools, and copies of the preliminary study of school needs in the defense areas made by the U. S. Office of Education are available from the Office of Education as long as the supply lasts. The items available from this source are (2, 4, 5, 8, 11, 14).

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PART II

Planning and Constructing School Buildings and Grounds

CHAPTER IV

Architectural and Educational Designing of School Buildings

Section A.—Educational Designing¹

W. F. CREDLE

SUPERINTENDENT F. H. GILLILAND listed a number of faults in recently constructed school buildings in his city and suggested that "if school administrators gave as much literary stress to the deficiencies of buildings as they do to successful features, school architects would be beneficently informed and the net result would be better planned buildings and a wiser selection of building materials." The line of demarcation between educational and architectural designing has always been a variable one. The *Architectural Record* (4) emphasizes, by implication at least, the passing of classic columns, gargoyles, belfries, steeples, and other useless adornments and the rather universal acceptance of "modern" architectural designs for schools. One could wish that these new types of exteriors clothed correctly educationally planned buildings. The departure in architectural design does not always connote an improvement in those functions essential to the educative process.

Paradoxical as it seems, notable gains in both educational and architectural designing have been achieved because patient and learned educators and architects have been able to make objective and scientific contributions in each other's field. Proctor (17) found countless omissions on selected plans of architects. He produced a work that has been invaluable to architects and schoolboards alike. Thoughtful architects should reread this study and consider its implications, for the indictments made, though not necessarily so directed, are really against incompetent architects. Pruett (18) found in studying the elementary-school standards for thirty-five states that over 1,700 adjectives and adverbs, such as "good," "well," "adequate," "clean," "suitable," "sufficient," and "proper," were used to define educational requirements of buildings. The implications are clear. Educators should supply the architects, not with general adjectives and adverbs, but with figures, dimensions, colors, and other definite educational requirements for school plants. They should then demand that the archi-

¹ Bibliography for this section begins on page 170

tect produce plans pleasing in design and assume "all responsibility for character of materials, strength of construction, safe loads of buildings and other factors of safety." The architect should also be charged with responsibility for the mechanical equipment, including heating, ventilation, plumbing, and such other equipment features as air washers, humidifiers, electric wiring, gas pipe, vacuum cleaning, program clock, interphone system, and for grade of material, quality of fixtures, character of workmanship (17).

Assistance from State Departments of Education

According to Barrows (5), "twenty-two State Departments of Education have staffs varying from one to nine members who give all their time to school building work, with funds allocated for that purpose." They are Alabama, Arkansas, Georgia, Minnesota, California, Kentucky, Mississippi, Connecticut, Louisiana, Missouri, Florida, Michigan, New Jersey, New York, Texas, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, and Wisconsin. In nineteen of these state departments, school building work is carried on under what is known as either a "Division of School Buildings" or a "School Building Service." In three states no specified title is given for the work except for the title of the "director" who, with the members of his staff, gives all his time to this work. While practices vary in the several states, all of them are concerned with educational designing and the functional planning of schoolhousing projects.

These "divisions" are manned by personnel trained in schoolhouse planning and educational designing, and having technical knowledge of architectural planning. Through their specialists they are able to advise and counsel with educators and architects alike. The arguments in favor of the establishment of such divisions in all state departments and large city units are many. Perhaps the southern states offer the most convincing evidence of the worthwhileness of these divisions. The majority of them had their inception through grants from the General Education Board; since the withdrawal of aid from this source, all the states have seen fit to continue them.

The National Council on Schoolhouse Construction (11) and the National Advisory Council on School Building Problems have put forth much effort to have such services established in states not having them.

Trends in Design of Buildings

Howard Dwight Smith, (20) in the "Review of Educational Research" for October 1938, reviewed trends in both architectural and educational designing. Smith noted that "modern" designs have already made their advent. Five fairly recent magazine issues provide a reasonable diversity of examples to indicate influences and trends as to plan, arrangement, and exterior appearance. They are: *Architectural Forum* for June 1936; *Architectural Record* for June 1936, April 1937, and May 1938; and *American Architect* for April 1937. Among these issues several foreign

buildings of current interest appear. "Modern Bibliography of School Design," by Sykes, fills ten pages in the June 1936 *Architectural Record*.

The student of educational designing should read Noffsinger's *Century of Progress in Special Instructional Rooms* (16). Noffsinger closes his article with the statement that "the most outstanding difference between the school buildings of 1900 and the ones of today lies in the provision for special rooms" (16). John E. Nichols (6), supervisor of buildings and plans, Connecticut State Department of Education, definitely inter-relates the functions of educators and architects, and at the same time defines the spheres in which each should work.

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Section B.—Trends in School Architecture and Design ²

N. L. ENGELHARDT, JR.³

Schools of Last Century

Architectural design of school buildings, in a broad sense, may be viewed as an expression of the attitude of people toward education. Changes in design over the years and variations in treatments among places reflect gross shifts in the positions which education has held in society. To be able to recognize basic alterations as contrasted to mere improvements in building design, it is almost essential for one to review the history of school architecture and to evaluate new changes in the light of new educational emphases.

Reviewing the architectural history a hundred years ago, one finds many educators of that period describing schoolhouses as shabby and neglected structures. Barnard (5) wrote:

Go where he would, in city or country, he encountered the district school-house, standing in disgraceful contrast with every other structure designed for public or domestic use. Its location, construction, furniture, and arrangements seemed intended to hinder, and not promote, to defeat and not perfect, the work which was to be carried on without and within its walls.

Mann (16), in his report of the Massachusetts Board of Education, stated that the sums expended for the erection and repair of schoolhouses "fell but little short of seven hundred thousand dollars" during the five-year period. This report went on to say that "in regard to this great change in schoolhouses it would hardly be too much to call it a revolution. . . ." In New York State at this time there were approximately 9,368 school buildings of which 7,685 were of framed wood; 446 of brick; 523 of stone; and 707 of logs. Only 1,541 of these schools had suitable playgrounds according to Young (21).

Many of the schoolhouses of about 1845 were located on the principal highways with little or no playground, and lacked shade, trees, and restful, quiet environment. Reports of the state of Connecticut indicate that classrooms were 7 feet in height, 17½ feet wide, and 18½ feet long, holding thirty children. One report stated that eighty pupils were housed in a room 19½ feet square. Another showed that sixty or seventy pupils were housed in a room 7 feet high and 17 feet square. Many of the buildings were twenty to forty years old.

In 1832 the American Institute of Instruction said that ". . . if we were called upon to name the most prominent defect in the schools of our country, that which contributes most, directly and indirectly, to retard the progress of public education, and which most loudly calls for a prompt and thorough reform, it would be the want of spacious and convenient

² Bibliography for this section begins on page 177.

³ Assisted by Roger L. Downing and Andrew L. McIntosh.

schoolhouses." The schoolhouses prior to 1850 were badly located, exposed to noise and dust. They were small, badly lighted, not properly ventilated, and poorly warmed. The seats and desks were not comfortable or conveniently arranged. There were few or no blackboards, maps, or other apparatus and fixtures. There were no trees or shrubbery, no well, no sink or basin or towels, and no toilet facilities.

Barnard (5), in a book concerned primarily with the design of schoolhouses from the point of view of educational use, gave considerable emphasis to ventilation, heating, and sanitary facilities. He also recommended seats and desks to be made to fit young children and not adults. He listed apparatus which should be included in every classroom. He stated that every recitation room should be lined with blackboards. He recommended slates for every scholar, a clock, a linear measure, compass box, and "articles which the pupils can touch, see, examine, experiment with, copy on the slate or blackboard." Barnard also wished to make the schoolhouse a depository of the district library "open to teachers, children, and adults generally of the district, for reference and reading. . . ." He went on to say that "the farmer, mechanic, manufacturer, and in fine, all the inhabitants of a district, of both sexes, and in every condition and employment of life, should have books which will shed light and dignity on their several vocations, help them better to understand the history and condition of the world and country in which they live, their own nature, and their relations and duties to society, themselves and their creator."

However, the use of the schoolhouse by adults was limited to the library, as is indicated in the following: "In small villages, or populous country districts, at least two school-rooms should be provided, and as there will be other places for public meetings of various kinds, each room should be appropriated and fitted up exclusively for the use of the younger or the older pupils." In 1858, Johonnot (14) wrote a book which was the first real effort to apply the principles of architectural science to the construction of schoolhouses. Johonnot (15) broadened his efforts in 1871.

During the period immediately following the Civil War, there was a tendency toward the architectural development of schoolhouses. As Johonnot stated (15):

For the past few years architectural science has made rapid and decided progress. . . . Evidences of this progress may be seen in the superior elegance of the modern public edifices and private residences of our cities and villages. . . . Of all the buildings, however, the last to feel this progressive impulse were schoolhouses.

The old log school-houses can be remembered by most of the older inhabitants. It was a necessity of primitive times, and was on an equality with the dwellings of the people. A better kind of structure has succeeded it, though we find in the last report of the Superintendent of New York (1870) that one hundred and twenty log school-houses are still in existence in the Empire State.

The reports of the Superintendents of several States within the past few years, show that an improvement has gone on in many sections, indicating a genuine educational revival. And yet a large proportion of the schoolhouses in the country are but illy adapted to meet the high requirements of modern educational ideas. Even the newer and costlier houses are often built without proper knowledge of the wants and neces-

sities of the school, while a very large number of the older houses are utterly unfit for human occupancy.

The buildings to which *Johonnot* referred were of poor construction. The foundations were weak. The building materials were of the cheapest kind. The seats were without backs and often were too high to permit the feet to touch the floor. The rooms were crowded and the ceilings were low. There was no ventilation except that which was offered through small windows. In many cases there were no privies. The buildings were generally located at corners where several roads met, with no playground space except the streets even in country places where land was cheap.

These conditions led to emphasis on health, comfort, convenience, and cost. These elements were prerequisite to the proper development of an educational program, but because of their importance little was written about the design in terms of facilities for enhancement of the educational program. About this time New York State passed the law giving the right of eminent domain for school sites. This permitted the establishment of schools on the most favored sites. Recommendations were that schools have at least one acre of land. Out-buildings were recommended by *Johonnot* (15), but *Eveleth* (10) showed plans for buildings in which toilets were made an integral part of the main structure.

The architectural designs of the schoolhouses of this period were of American origin. The city schools were two and three stories in height and extremely plain on the exterior. An English writer (18) in discussing American schools stated that “. . . the architectural character is that of a detached, well-built warehouse. The architectural designs . . . are extremely plain, not particularly school-like in character, and of no special English interest. . . .”

Early Twentieth-Century School Buildings

The latter part of the nineteenth century brought revolutionary changes in schoolhouse design. The introduction of steel for supporting members, the increase in use of brick bearing walls, central heating and ventilating plants, the advances in architectural design, and the need for larger buildings established a new era of school construction. Perhaps the most significant phase of this movement was the development of detailed plans and specifications for each individual building. Previously, standard plans were given to contractors with only the most abbreviated specifications.

In 1901, *Wheelright* (19) wrote a treatise which gives striking evidence of changes in schoolhouse architecture when comparison is made with *Johonnot's* book (15). It should be noted that many of the buildings of the early 1900's are in use today. The plans of the elementary-school buildings were quite similar in several respects. Play rooms and toilets for each sex were provided in basements. The first floor contained classrooms ranging from 25' x 32' to 28' x 37'. Invariably the assembly room was placed on the second or third floor. An office for the principal and a manual train-

ing room were sometimes provided. Fixed seats, extensive blackboard space, and a limited amount of equipment were found in the classrooms.

The high schools built in the cities during this period contained laboratories, gymnasiums, lunchrooms, assembly rooms, and auditoriums. The gymnasiums, locker rooms, and toilets were located in the basement, as was the case in the elementary school. Architectural design of many of the buildings was transmitted from the Teutonic countries and the simple colonial boxes gradually disappeared except in rural regions during the early twentieth century.

In 1921, Donovan (6) contributed to the literature of the field. Expressing a motive for school architecture, he stated:

There is nothing more impressive or hopeful in American democracy than the devotion of the people to education. . . . Unconsciously the spirit has been to represent truly this national devotion to education in the architecture of public schools.

One of the important functions of school architecture is to sell education to the public. This is accomplished by making attractive that side of education which the public sees most.

During the period 1850 to 1920, school architecture advanced from the low point of complete neglect to a high point of monumentalism. School buildings changed from small, shabby units to large, beautiful edifices, glorifying the people's devotion to education. The interior planning, however, expressed little change in educational method except, perhaps, in those elements of the schooling process associated with larger pupil population. The perfection of administrative technics for handling large schools was an important factor influencing interior planning. The suggestion of a mechanized process of education has been expressed in the not infrequent factory-like design of school buildings during the past few decades.

Recent Developments

In the last issue of the school plant volume of this REVIEW (16), several important points were made foreshadowing the possible basic changes in school architecture. These points may roughly be divided into three categories, namely: those growing out of added responsibilities of the schools, those developing through new materials and methods of construction, and those which are created by a broad recognition of the changing place of the school in the community.

The addition of health clinics, general shops, gardens, and other activity centers represent added responsibilities and changing methods. The earthquake-proof construction of California schools, the use of plywood walls, insulation, and acoustic treatment illustrate changes brought about by new methods and materials available to architects. These changes, however, merely tend to improve and expand traditional school design. The classroom unit still remains. The exterior façade is still monumental with its columns, massive entrances, terraces, and bell towers. In some cases the so-called "modern" architect has shorn the façade of ornament, but he

has frequently retained the monumental character by distribution of masses.

Here and there throughout the country there appear signs of another basic change in school architecture. It is primarily a movement away from the monumentalism of the past four decades. People are not using their school buildings to sell their communities. The school building is being developed as a more intimate and better integrated element of the community, a place closely associated with child and adult living. It is more of a community workplace and recreation center. Location on a main highway or on a hill as a vantage point for attraction of potential citizens has been discarded in favor of sites more intimately associated with community living.

Engelhardt and Engelhardt (9) expressed this changing attitude when they said:

The modern school architecture, if it is to be an honest expression of the place of the school in present-day environment, must accept as its theme participation by all members of the community. It must express informality. The break with the past must be based on the elimination of institutionalism. Security must be expressed not by monumentalism, but rather by stimulation and attraction which bid all welcome to the school in times of need. Then, too, the truly modern style must express function, and the functions of the school are as varied as life. Flexibility of these functions to meet the needs of a dynamic society should be a vital consideration.

These changes were also reported in the *Architectural Record* (4):

In 1939 and 1940 *Architectural Record's* Building Types studies on schools reported numerous changes in school design principles which educators advocated. In teaching practice there has come to be an increasing emphasis upon laboratory methods, in even the most static subjects; and the pupil's school life is being integrated with the community—and vice-versa. Also, the past few years have introduced a need for structural economy, and it has been recognized in many parts of the country that requirements change so rapidly that the plan must be flexible, the entire plant dynamically useful.

In contrast to the architectural motive expressed by Donovan (6) twenty years ago, it is interesting to note the emphasis in a recent letter of an educator to his architect published in *Architectural Forum* (2):

All the architecture shall be a setting for childlife. Everywhere children and what they can do shall be the adornment of the structure. The building itself shall be the place of joy in living. But I must warn you. It must be a place which permits the joy in the small things of life, and in democratic living. These two things we must safeguard in children's lives. The building must not be too beautiful, lest it be a place for children to keep and not one for them to use. Its materials must be those not easily marred, and permitting some abuse. The finish and settings must form harmonious background with honest child effort and creation—not one which will make the children's work seem crude.

Above all the school must be childlike—not what adults think of children. At the same time it should be dignified, and playful, but not a playing down to children. It must be a place for living, a place for use, good hard use, for it is to be successively the home, the abiding place for a procession of thousands of children through the years. It must be warm, personal and intimate, that it shall be to each of these thousands "My school."

Campus Plan

Harrison (13) has envisioned many basic changes in schoolhouse design—"The modern school building should be a building that invites people to enter." Engelhardt and Engelhardt (9) pointed to the "campus" or "open" plan as a design trend:

Some indication of the trend in the design of community schools is to be found in the wider acceptance of the "campus" plan. This plan calls for small separate units connected by arcades or passageways and attractively grouped. This type of arrangement is quite flexible and eliminates much of the institutional atmosphere of the large, compact structures.

Much emphasis has been given to the open plan in California. It is possible that this development has not grown so much from changing educational practice as it has from structural needs. The *Architectural Record* (3) pointed out in connection with a school at El Monte, California: "Two factors determined the choice of open plan, with departments housed in separate structures: the local soil-bearing value was very low; the buildings had to be designed to resist earthquake stresses." Engelhardt (7) recommended the campus idea and suggested that its absence is a definite limitation of the older type of school. Wright (20), in his study for his model community, Broadacre City, stated:

The school problem is solved by segregating a group of low buildings in the interior spaces of the city where the children can go without crossing traffic. The school building group includes galleries for loan collections from the museum, a concert and lecture hall, small gardens for the children in small groups and well-lighted cubicles for individual outdoor study; there is a small zoo, large pools, and green playgrounds. This group is at the very center of the model and contains at its center the higher school adapted to the segregation of students into small groups.

Community Centers

In a comprehensive study of the use of high schools as community centers, Fulcomer (11) definitely indicated a trend in the use of school buildings by adults. Although many of the buildings analyzed by Fulcomer had some community use features, there were few which could be considered complete community centers.

Fulcomer (11) also studied PWA requests for community buildings aside from schools and found that:

With the exception of the police court and detention allocations, there is not a single facility indicated in these community building plans that is not a common feature of secondary plants. In fact, such space allocations are those most frequently represented in the plans analyzed. The provision in the secondary school building of these facilities would serve both the high school students and adults to advantage, as the discussion of the community nature of many needs of both groups has already indicated.

Engelhardt (8) has expressed one of the problems of the use of schools as community centers as follows:

There are very few communities in the United States where some integration of school and community life is not taking place. The question that each community

should raise is whether the school cannot function in the economic rehabilitation and social recreation of all its citizens, and how the community program can be best developed toward this end. The institutional character of many schools has been a barrier to widespread community and adult use. In many instances adults have so disliked the formal school program of their youth that they tend to refrain from entering school buildings again. The very atmosphere of the school is repressive to them. A discovery of the degree to which this is true in any community might well result in rethinking the existing program for the community's youth.

Hare (12) wrote on the relation of the public school to the development of the community theater.

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Section C.—Trends in School Architecture and Design —Current Developments⁴

FRANCIS R. SHERER

Perhaps no decade other than the last has seen such marked advances in schoolhouse planning and design. By no means, however, have we reached a point where all current planning would find itself in accord with the ideas of a majority of the outstanding school planners in this country. If we were to point out some of the more important factors responsible for this improvement, we should mention first of all the better collaboration now given upon a project by the educator, administrator, and architect. Organizations that have made marked contributions are the National Council on Schoolhouse Construction, the National Association of Public School Business Officials, the American Association of School Administrators, and the National Advisory Council on School Building Problems. The creation of building divisions in the state departments of education has likewise proved of inestimable value in bringing about better school plants. Unfortunately, at present only twenty-two of our forty-eight states give this type of service by persons whose major interest and training are in the field of building, planning, and construction.

Perhaps no one organization has exercised greater influence on the planning and exterior design of smaller buildings than has the Julius Rosenwald Fund (8) in connection with its program for building Negro schools in the South, by means of their financial and supervisory assistance to approximately 5,000 such buildings. Much has been said and written about the effect of the Public Works Administration in the period of its financial assistance for school plants throughout the country. Although the speed, with which drawings had to be made and projects gotten under way, was such as to leave insufficient time for studied planning, the reviewing engineers at Washington wisely adopted a set of construction standards which resulted in good buildings. Although there were many errors in educational planning due to a lack of immediate knowledge on the part of those responsible for the planning and insufficient time in which to assemble the proper information, the experience will not have been too costly if it serves as a proper warning should there again be a program of federal aid. The educational journals and the architectural magazines (1, 2, 3, 11, 14) play a significant role in disseminating information for the betterment of school planning and designing (9, 15).

Exterior Treatment and Design

The days of the construction of even a small schoolhouse by a builder without a well-studied plan have come to an end. Also nearing an end is the architect's frequent conception of a community school as something

⁴ Bibliography for this section begins on page 180

that must be monumental so as properly to dignify the community, and sometimes, perhaps, himself. It is interesting to note, however, that the modern influence in the exterior treatment of our school buildings is growing. The day of applied ornamentation, with the mistaken idea that beauty was being created, is fast disappearing. In large measure this is due to the fact that the more competent and highly trained architect is being employed (4). The school building of today is more apt to have its exterior simple in line and ornamentation, depending for its beauty on proper massing, proportion, materials, and color harmony.

Classrooms and Other Interior Design

Code requirements and so-called standards should serve only as they are truly intended to serve, namely, to indicate minimum requirements. For example, in setting up the requirements of an elementary classroom as being 22 feet wide and 30 feet long, it was not the intention that such a size room was all that would be required. The proper interpretation would be that the room should be not less than 22 feet by 30 feet and should be as much larger as would be necessary in the light of the type of program to be carried out, the optimum size of the class, the existence in other parts of the building of special facilities for certain activities, and provision for storage of supplies and projects. The trend is toward larger classrooms, and already rooms 24 feet wide and 35 feet long have appeared for a class size of 40 (6).

More is being done about building features in the classroom which thus become a part of the school building. In elementary schools, less blackboard is being installed and an increased amount of display board. Ample storage space is provided, some enclosed with doors, others open, particularly shelving for books and projects, extending from floor to chair rail so that the children themselves, even in the kindergarten and primary classes have access to the materials. An atmosphere of warmth and cheerfulness is sought through the use of color, sufficiently varied in hue and shade so as to defeat institutional atmosphere (6, 7, 10, 12).

Interior planning has become progressively better not only in the instructional area but also in such essential factors as safety to life, health conservation, good housekeeping, and economy of operation and maintenance. A study made of many school fires and disasters has led the Building Exits Code Committee of the National Fire Protection Association to formulate a code of minimum requirements for corridors, passageways, stairs, and exits for both new and existing school buildings. The National Council on Schoolhouse Construction as a member of that committee for the past twelve years has had a hand in formulating some of the requirements to provide exits sufficient to empty school buildings promptly after an alarm of fire has been given, and to provide for construction such that buildings may be emptied without danger to life by fire, smoke, or resulting panic.

Consideration of Operation and Maintenance

The newer buildings have been planned with more attention to the housekeeping problems. To some extent this results from an improved custodial force sufficiently articulate and progressive to make known the failures and weaknesses of the many schools that on the surface were considered to be "wonderful" but below the first floor a different story was told.

Accessibility of sink rooms, plenty of hot water, a knowledge of cleaning materials and techniques, suitable materials of construction and finish, freedom from ledges, projections, and dust catchers as evidenced in the present schools make the janitorial job not only a more interesting one but result in attracting higher type persons to that field of service and make for economies in labor and cleaning supplies.

The architect plans to some extent in the light of the materials he proposes to use. In no one phase of the school plant problem has there been any more effort given toward improvements than for materials of construction and finish. In recent years many articles have been published and many meetings held at which discussions centered on this important subject; for example, the National Association of Public School Business Officials for several years has had committees engaged in long-range studies on various phases of the school plant (9). Recently they have published reports on school flooring and on playground surfacing.

Larger school systems maintaining specialized personnel for the direction and supervision of plant operation and maintenance are continuously experimenting with new materials and methods. Quite properly, the good architect is not too easily influenced by that which will make for lowest initial cost without full regard for the matter of recurring maintenance and operating costs. So, frequently it happens that an increased initial outlay would have substantially prolonged usefulness, as in the case of brass pipe for hot water lines versus galvanized steel, or in the case of excessive heat losses through poorly insulated roof decks.

Among the errors to be avoided in school planning is the tendency to copy some facility or feature of planning which is ideal for one climate but which proves to be an indefensible expenditure of money in another area where low temperatures, snow, and ice make the facility unusable most of the year. It stands to reason that school plants of differing types of construction and arrangement will best satisfy the needs of certain areas because of climatic differences.

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CHAPTER V

Legal Aspects of Planning and Constructing School Buildings¹

S. M. BROWNELL

STATUTES OF THE FORTY-EIGHT STATES each provide the authority and limitations under which school districts and school officers may or must proceed in the planning and constructing of school buildings. These provisions may cover directly, or through power granted to school officers, such things as the designation of school sites, the approval of the site at an election, the issuance of bonds (including special procedures for the election to authorize bonds, legal debt limitations, possibly the necessity of approval by state authorities, and regulations as to the sale of bonds), selection of and contract with an architect, advertising and letting of bids, making of contracts with builders, securing statutory lien and performance bonds, payments for work done, acceptance of the building, protection of workers and the public during construction, liability for fire, theft, and other damage during construction, state approval of plans, the force of building codes, purchase of and payment for equipment, and the authority of special building committees other than boards of education. It is possible to have disputes arise around each such provision with resulting court action.

Research literature concerning these problems during the past three years is confined to one study of the "lease and option" device for avoiding constitutional limitations on the indebtedness of school districts in Kentucky for the Kentucky Law Journal (18), portions from two valuable contributions to the field of school law in the form of mimeographed case and legal problem books on school law (15, 16), and reports of court decisions. These reports may probably be considered research if one accepts the premise that each case in and of itself represents research.

Sources for Study of School Law

Hamilton's case book (15), which briefs approximately 110 cases, is of particular significance as being more than a sampling of cases in the field of school law even though it contains but few notes. Quotations from the preface will best serve to illustrate the point of view of the author.

That educational law is far behind modern educational thought is apparent. Much of the litigation affecting schools is partly the result of inadequate and antiquated school legislation and partly of the fact that school administrators do not realize the legal pitfalls inherent in their positions until they find themselves and their districts involved in litigation. . . . It is believed that the use of the cases along with any standard textbook on school law and the statutes of the states . . . will provide a

¹ Bibliography for this chapter begins on page 189.

more complete and well-rounded course in school law than would be possible with any other combination of materials. . . . When the continuity of the case does not suffer thereby, an effort has been made to delete as much technical discussion . . . as possible. . . . The notes to cases are designed to show how the courts work and to dissipate any idea the student may have that the law is a rigid set of rules which lead inevitably to a given conclusion. If a study of the cases does not convince the student that rules and principles of law are merely tools in the hands of the courts which are used by them to reach results which they consider desirable, this work will have failed in one of the chief purposes for which it was designed. From such a study it is hoped that the student will gain some idea of the extent to which the attitudes of courts are in accord or in conflict with modern educational thought.

Hodgdon's case and problem text in school law (16), which briefs approximately 125 cases, constitutes Part I of Educational Jurisprudence. Part II is yet to be issued. The book briefs cases, intersperses them with comments noting the educational significance of the point under discussion, and lists problems for study and discussion. The function of the book is indicated by these excerpts from page two and from the introduction, which state that the cases included deal with "the definition, philosophy, theory, and control of education; the administration of schools, teachers' rights, duties, liabilities, and administration and control of pupils, parents' and pupils' rights and duties, and textbooks."

The material in this book has been selected from leading cases in the various state courts and the United States Supreme Court. The decisions of these courts have controlled our philosophy of education. The courts have been called upon repeatedly to define the function, purpose, and philosophy of public education in the United States. In order to understand the philosophy and history of education in this country it is essential to study the judicial philosophy of the final authority to which all education must bow. . . . No matter what theories education reformers may entertain or promulgate, the courts are the final authorities to disapprove, modify or accept such theories. They will favor only those that they believe to be based on fundamental principles of public policy (16).

The *Yearbook of School Law* (9)² continues to provide a narrative topical summary of decisions of the higher courts in all states in cases involving school law. More frequent brief reviews of court decisions involving school law are provided monthly in the *American School Board Journal* under the title "School Law." These are the two major sources to which school officers and staff members can most readily turn for the gist of current court decisions of concern to the schools. *The Clearing House* likewise presents each month under the heading "School Law Review" some particular phase of school law based upon principles of law involved, problems in the field, and court decisions. During the three-year period, however, it did not include any discussions related to the planning and construction of school buildings. A similar department called "Some Recent Court Decisions" was provided in *Educational Law and Administration* (14), which ceased publication with the October

² References in the bibliography from these yearbooks appear under the name of the author contributing the chapter.

1939 issue. Other reports appeared in occasional articles dealing with some special problem of school law.

One word of caution seems desirable before presenting brief statements concerning court decisions as found in the reviews. Each case has its setting in terms of particular facts and the laws of a given state. Reviews do not have the space to give the complete details. The further compression here of findings, out of their setting, may easily give an erroneous impression concerning the general applicability of a decision which was reached because of peculiar circumstances of time, place, and specific state law.

Plans of Financing School Buildings

In cases involving questions of federal aid, the courts decided that Congress had power to control local projects under the Public Works Administration since the PWA was to be considered as a whole and was justified under the general welfare provision of the Constitution (22). Courts decided that PWA regulations included in a contract did not delegate discretionary power of the board of education (22); that acceptance of a federal grant did not limit a district to sell its bonds to the federal government (22); that the offer of federal aid for the construction of a school building did not constitute a bribe, prevent a free election, or hinder the right of voters to exercise the elective franchise (23); that a given district could issue and sell bonds before a federal grant had actually been made on a proposed project (19); that an agreement by the federal government to grant funds could be considered equivalent to money in hand (23); that a local district might prudently include in a building contract the provision that on each payment to a contractor the federal government should pay its agreed percentage (22); that the legislature had power to enact a statute to allow acceptance of federal aid although it conflicted with earlier legislation, and that by the language of the act in question it clearly superseded the earlier legislation (23); that a state appropriation bill did not include federal funds because the state had no power to appropriate federal funds (8), and that a school district might turn over its entire school plant to a municipality in order to become eligible for federal aid (19).

Court action affirmed the legality of financing school buildings through a state authority in Pennsylvania (1) and bonds issued by the authority were held not to be obligations of municipalities, school districts, or counties (19). In Arkansas, legislation was declared unconstitutional which attempted to permit the state board of education to issue bonds in order to assist local school districts in constructing buildings (19). In New Mexico a contract was held constitutional and legal when a local district issued bonds for a school building in which a state teachers college was to conduct a training school without tuition to the local students (7, 8, 19).

Bonds issued by state colleges and universities which pledged student fees were declared legal, not an obligation of the state and not an increase of the state debt (3, 22, 23). In fact it was held that a college might agree to lease space in a proposed building, the rent to be paid from the annual tax levy, without creating a debt (23, 29). Also *mandamus* proceedings to force collections of fees and distribution to bond holders was declared not a suit against the state and hence might be granted (23). In the case of a municipality pledging *ad valorem* and license taxes for the payment of bonds, it was noted that legitimate operating expenses must first be paid even though bonds apparently claimed exclusive pledge of certain revenues (29).

Financing of construction through a holding company which issued bonds and erected the building under a mortgage and lease arrangement received approval and disapproval of the courts under differing circumstances (14, 19, 24, 28). Lovett (18) made this plan of financing the subject of an intensive study.

The use of funds raised for current operating expenses to finance building construction resulted in several court actions. It was held to be beyond the discretionary power of the board of education in some (2, Nov. 1939; 19), in others it was permitted (2, Aug. 1939; 29; 31), while one court held that this plan of financing was permissible only if surplus funds were used (31).

The authorization of bonds by a schoolboard without an election was held illegal under the facts of the case (28) and a board of education was held not to have power to fund anticipated revenue through bonds or warrants (13, 15, 26). However, schoolboards were held to possess a measure of discretion concerning the financing of school construction (2, July 1940; 4).

Two different actions involved counties. One held that a district in North Carolina which voluntarily constructed a schoolhouse could not demand that the county pay the cost (19). The other held that a county school district in Kentucky had no legal authority to issue bonds (20).

Bonded Indebtedness

Discretionary powers of the board of education in issuing or retiring bonds were challenged in a variety of cases. An election was declared unnecessary where a district indebtedness would not exceed a percentage set by the statutes (19) and when more than a majority of voters signed petitions favoring a bond issue (21), but under other conditions an election was declared necessary for the issuance of bonds (28). Boards of education were held to have the power to carry on campaigns for school bond elections in one case (2, Dec. 1938). In expending the money from a bond issue, schoolboards were directed to carry out the purposes for which levied, or, as stated in the election notice and on the ballot (21), not to expend money that was derived from bonds

issued for a new building for repairs on an old one (2, Jan. 1940). Bond proceeds were declared usable for equipment where legally voted and not exceeding the statutory limit (2, Sept. 1940). In management of taxes raised for the retirement of bonds, it was ruled that the statutes left as a discretionary power of the schoolboard the disposition of any surplus (21). In another case it was held that an election was necessary to permit any other use of bond retirement tax money (21). In still another situation the board of education was held to have power to apply a tax surplus to accelerate the retirement of bonds (32). In school districts having insufficient funds collected to redeem all matured bonds, one decision reached was that the money should be applied on all bonds *pro rata* (21). Another was to the effect that the court could not compel a schoolboard to choose one method of payment when several methods were available (21). A third decision refused to compel the use of all money collected to go for bond payments on the grounds that not to provide for current expenses would be against public policy (21).

Davis (10) reported a study of school laws which indicated considerable agreement among the states as to general provisions for bond issues. There were a dozen or more suits, however, seeking interpretation of statutes governing the issuance of bonds and testing the validity of bonds. In one case the court stated that every phase of the law was material to the validity of bonds (19) while in another situation it was held that bonds would not be held invalid because of a technicality (19, 20, 24). Where there were conflicting statutes, the court was held to have power to interpret which statute governed (19). Statutory requirements which courts held essential to have bonds declared valid were: approval by a state debt commission (19); the vote of two-thirds of the actual taxpayers rather than two-thirds of those on the tax roll (21); election under the school laws rather than the general election laws (14); and the following of the statutes governing the actual population at the time of the bond issue (2, March 1939). It was held also that the validity of the bonds could not be questioned unless protest was filed within the time set by law (21); after the funds had been used in good faith for a legal purpose (21); or after judge by decree had approved them (21). Bonds for equipping a school were declared valid where legally voted and within the statutory limit (2, Sept. 1940). It was held in one case that the power to borrow granted by the statute included the power to issue bonds and pay interest (17). In other cases it was declared that the statutes determined who should vote on a bond issue (21) and that a schoolboard could not waive a statutory provision making bonds callable by issuing noncallable bonds (28).

In reference to the effect of statutory debt limits and annual expenditure limitations on the issuance of bonds, refunding bonds were stated not to represent new debts (2, March 1939; 20). Municipalities with special charters were judged to be exempt from general debt limit statutes

(19) and annual expenditure limits were held not to repeal the power to borrow unless the power was specifically repealed in the statute (17).

Building and Architectural Contracts

The cases involving building and architectural contracts during the past three years emphasize the points made by Chamberlain (5), Hamilton (15), Hodgdon (16), and Webb (27) of the need for an elementary knowledge of the law of contracts by school officers and for the securing of legal advice in entering into important contracts. In cases testing their validity, contracts were declared invalid which attempted to evade the statutes (11); made orally in the face of statutory requirement for written contracts (2, March 1939); creating an indebtedness in excess of statutory limitations (12); made before funds were available contrary to statute (13); and when entered into by the superintendent without express authority from the schoolboard (2, March 1939; 2, July 1938; 26). Contracts were declared enforceable which extended beyond the services of board members (11, 12) or where funds were not available at the time (2, Nov. 1939; 2, March 1939; 12). Contracts made orally, though by statute required to be written, or otherwise illegally issued, were valid where the benefit of the contract had been accepted and used (2, Dec. 1938; 11; 28), except in one instance (2, July 1938).

An architect's contract was held valid though the cost of the proposed building would exceed the debt limit of the district (2, Aug. 1939), and an insurance contract was held to be in force when the premium was not paid, there were no written minutes of the meeting, the funds for insurance were exhausted, and the making of a premium payment would therefore have been an invalid charge (2, Nov. 1939; 29). The courts were called upon to decide what was included in the terms of contracts in several instances (2, May 1941; 11; 12), and in the case of a ratification of a contract held that ratification must be in manner and form the same as prescribed for entering into an original contract (12). In a suit to establish the legality of a contract, the provision that a bidder must be acceptable to the PWA engineer was held to constitute the delegation of power in making a contract which the board of education could not delegate (14), and that where a bond of 5 percent was to be provided by a bidder the amount must be equal to 5 percent of the largest amount under any possible combination of base bid and alternates (14). Where a building planned would exceed the sum authorized by voters and where changes in plans would make the cost exceed the authorization, a contractor was not able to recover from a school district for labor and material (2, Sept. 1939), and a university was declared, as an arm of the state, free from suit for breach of contract (8).

Statutory Lien and Other Protective Bonds

Questions most frequently before the courts in relation to protective bonds dealt with the extent to which deviations from the statutory requirement by bondsmen or claimants affected the claims and whether or not a bond extended to cover a given claim.

In one case substantial compliance was declared to satisfy the law in filing a mechanic's lien (11). In another, while mailing of a properly addressed letter was considered *prima facie* evidence of its delivery, testimony of the addressee that he did not receive it was held to present a question of fact for the trier (12). In other cases involving mechanic's liens and claims for payments under contractor's bonds, it was held that mechanic's liens are statutory and nothing can be considered but the statute which creates them (12); that those who first file claims and those who file within the statutory limit of sixty days shall have priority rights (12); that failure to follow the statutory procedures gives no protection to men who supply material (13); and that a contractor's bond cannot be severed from the statutory requirements (2, Feb. 1941); and that a mechanic's lien against a contractor is a claim against the contractor and not the property (2, March 1939).

Interpretation of the coverage of bonds depended in part on the statutes, but also on the language of the bond contract. Thus a bond to pay for all materials for a building was interpreted as not covering ladders and other items which might be used on more than one job (13); money lent by a material man to a contractor was not covered by a surety bond, nor was workman's compensation or public liability insurance (2, Dec. 1940; 13); a material man was entitled to recover from money owed a general contractor even though the general contractor had paid the subcontractor for whom the material was supplied all that was due him (2, March, 1940; 11; 13); the surety was found liable to a subcontractor under the terms of a bond it had issued to a contractor (2, Sept. 1940); and where a surety bond running to a school district read that the contractor would pay for all materials it was decided that a material man could maintain an action (13).

Other actions before the courts in relation to bonds brought decisions that a subcontractor was free to choose which debts he would pay from payments received (11); that priority to assigners of claims went to him who first filed his assignment (12); that a material man can maintain an action on a surety bond running to a school district provided it reads that the contractor will pay for all materials (13); and a lien was construed as a claim against the contractor and not against school property (2, March 1939).

Legal Procedures in Securing the School Plant

State regulations and school building codes of the several states were listed in Redford's bibliography of these on school buildings and equip-

ment (25). Under these regulations several cases were tried, with findings that an adequate description of property on the ballot, though technically in error, would not invalidate an election for a school site (24); that a school district may have as many school buildings as are needed (24), that the kind of buildings suitable for school must be left to the governing board (2, May 1941); and that the state has the responsibility to equip all its buildings with safety appliances (28). The responsibilities and restrictions of the board of education concerning the school plant are the subject of comment by Weltzin (30), and Chambers calls attention to the tangle of school law and its effect on the choice of public school (6). What constitutes the school plant and what the equipment, while incidental in a number of cases, were of major importance in a case where it was held that athletic supplies constitute school equipment (26). Hodgdon (16) cites cases of broad definitions of what constitutes the school plant.

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CHAPTER VI

Trends in the Construction of School Buildings¹

WORTH MC CLURE

THE TRIENNium 1938-1941 has seen "spend-lend" domestic policy superseded by "lend-lease" foreign policy, with consequent shift of industrial emphasis and greatly accelerated tempo of general business under the impetus of heavy governmental disbursements. Naturally this transition has not been made without repercussions in the field of school building construction. Previous REVIEWS have commented upon the paucity of systematic research in this field. Examination of the literature of the last three years reveals that this general characterization still applies in spite of the appearance of some excellent studies.

Use of the term "trends" must also be qualified. It is believed important to report not only what appears to be evidence of trends in the sense of preponderance of practice, but also to note, as such, tendencies which although of a minor character may have significance to thoughtful observers as indicating the beginnings of new movements or perhaps the recession of some which have previously been influential. The content of this chapter is therefore subject to both these qualifications.

Volume of Building

According to the most recent release of the U. S. Office of Education (14) on the subject, the school plant of continental United States was valued at \$7,115,377,402 or \$274 per enrolled pupil in 1938. This compares with \$6,731,324,741 or \$255 per enrolled pupil in 1936 (13). Average value per urban pupil in 1938 (14) was \$376; per rural pupil, \$167. The number of buildings in 1938 was 229,934, of which 52.8 per cent were one-room structures.

In 1938 there were 667 fewer buildings in urban (population of 2,500 or more) communities and 8,806 fewer rural schoolhouses than in 1936 (14). Major factor in this decline was reported to be a reduction of 11,635 in the number of one-room structures, which in 1936 represented 55.6 per cent of the total. It was also stated (*ibid.*) that during the ten-year period 1928-1938 the number of one-room buildings declined from 153,306 to 121,178. Smaller buildings in the smaller urban centers, it was stated, were also replaced by larger consolidated units. Evidence of this also was the fact that average enrolment of urban schools in 1938 was 497.7 pupils as against 480.9 in 1936. Average enrolment of rural schools for 1938, 62.1 pupils, remained virtually at the 1936 level.

¹ Bibliography for this chapter begins on page 200

In spite of the decreased number of buildings, however, there was reported an increase of \$21 per enrolled urban pupil and \$13 per enrolled rural pupil in the 1938 average value of the school plant over that of 1936. Capital outlays for sites, buildings, and equipment in 1938 totaled \$238,853,496 or \$10.71 per pupil in average daily attendance in continental United States. This figure compares with a total of \$171,321,674 or \$7.68 per average daily attendance pupil in 1936, and with a capital outlay of \$17.44 per average daily attendance pupil in 1930. Total enrolment declined 1.5 percent from 1936 to 1938 (14).

Effects of Federal Grants-in-Aid

Forrest W. Allen, director of information, Federal Works Administration, reported (1) that PWA and WPA together, operating "in nearly all the nation's counties, have constructed or improved nearly 40,000 educational buildings" at a total cost of \$1,457,869,066, exclusive of WPA activities since July 1, 1938. During the fiscal year ending June 30, 1939, the latter agency constructed or improved 8,248 school buildings, representing a total expenditure by WPA and sponsors of \$276,330,056. Since WPA projects active on June 30, 1938, but completed before June 30, 1939, were included in both sets of data, it was noted that cumulative totals were not to be derived by adding the corresponding figures for both periods.

Four purposes, Allen reported, were served by federal grants-in-aid: (a) to provide new facilities for shifting and growing populations; (b) to replace unsafe and obsolete small buildings with modern, consolidated schools; (c) to provide replacements for "obsolete, overcrowded buildings without proper heating, ventilation, lighting or sanitation"; and (d) to provide needed additions to existing buildings.

According to Smith (59), who reported on the basis of official figures, total value of educational construction projects aided by PWA, WPA, NYA, CWA, and ERA for the six-year period 1935-40 was \$1,801,100,000. Of this construction work, 70 percent was estimated to represent construction of elementary- and secondary-school buildings. Smith estimated building financed entirely by states and local districts during the same period at \$300,000,000, making a grand total of \$2,100,000,000 or a yearly average of \$350,000,000, equalling that of the ten-year period 1920-30 and amounting to 85 percent of the all-time high annual average of \$400,000,000 attained during 1925-30.

On the basis of personal investigation, Smith also reported the construction during the 1935-40 period of 5,358 Negro schools, mainly rural, in 883 counties of 15 southern states, with a pupil capacity of 663,000, replacing some 10,000 "dilapidated, unsightly buildings." Credit was given also to the Julius Rosenwald Fund for assistance by provision of matching funds.

Efficiency of Planning

Allen (1) reported that federal aid programs required fire-resistant and earthquake-resistant construction. Editorial commentators (5) noted that insistence upon modern design had "almost eliminated" the historic styles and that PWA buildings had cost more but were safer, and stressed the need for research in planning along lines of adaptability to new programs and costs of the new services. In an analysis of 198 PWA projects in 163 communities in 52 of the 62 counties of New York State completed between June 1933 and July 1936, Herber (32) concluded that the increased cost due to PWA regulations ranged between 10 and 15 percent; that better quality of construction resulted, particularly in smaller communities; that building layouts were determined locally with advice of the state education department; that, indirectly through time limitations, planning was affected; that besides the buildings themselves, landscaped grounds, larger buildings, and gymnasiums were the most commonly reported facilities beyond what would normally have been possible. Herber's findings regarding the time element in construction with aid of PWA were confirmed by editorial judgment to the effect that the haste involved prevented desirable advance planning (5).

Schmidt (57) noted a trend toward prebuilding surveys. School surveys reported commendable advance planning of new and projected construction in relationship to city planning (60, 61). Quality of new construction also conformed to acceptable standards of safety, sanitation, and general character of construction. Tendency to think of a school building as a standardized unit without provision for special needs of the community was criticized. Both studies provided data for long-range planning of the school plant in terms of population trends and social needs.

State relationships to planning—State education departments have been active in advisory assistance to local districts where legislation has made such services available (19, 30, 32, 48, 60, 63).

Financing Construction

Comprehensive studies of financing during the three-year period are not available. Moehlman (41) and Mort and Reusser (43) agreed that bonding is still the universal practice in financing construction. The former recommends the pay-as-you-build policy while the latter believe bonding more feasible in smaller districts and more likely to assure adequate provision for educational needs. Among disadvantages noted were increased total cost and tendency toward extravagance. Indebtedness of school districts has been limited in most states (43). Moehlman reported that by January 1939 seven states had aided local district projects (41).

Total indebtedness of school districts in continental United States was \$2,835,050,566 in 1938, as compared with \$3,043,125,380 in 1936, representing a decrease of approximately \$10 per pupil (14).

Expenditures for debt service totaled \$283,846,442 in 1938; \$204,-682,410 in 1936. These figures compare with a total of \$144,950,229 in 1930. Average interest charges in bonded and current indebtedness were \$5.12 per average daily attendance pupil in 1938, \$5.96 in 1936 (14).

Construction Costs

Costs of general construction have risen during the 1938-41 period. Shute (58) reporting national trends in average costs for residence, apartment, commercial and industrial building showed that 1941 costs of all these types of construction were higher than in 1938. Shute's figures were based upon costs in sixteen geographically representative cities. Another national index, based upon quantity and price analysis of four types of building—frame, brick, concrete, and steel—and based upon costs in thirty geographically distributed cities, stood at 215 for May 1941 as compared with an average of 199 for the year 1938, the yearly average for 1913 representing 100 (2, 3).

Notable work was done in the field of cost analysis. The St. Louis survey (60) revealed differences in the costs of brick work and cut stone to the advantage of more recent construction. Concrete and steel frame buildings were found to be cheaper than wall-bearing structures. In the Pittsburgh survey (61), cost analyses were related to (a) space allocations in several recently constructed buildings; and (b) costs of general construction, heating and ventilating, electrical work, and plumbing. Among units found advantageous for analysis were the costs per cubic foot of habitable space and per cubic foot of educational space.

Two studies, reported in an earlier chapter in this issue, will greatly facilitate objective comparisons of building plans hereafter and lay the basis for trend studies. These are the studies by N. L. Engelhardt, Jr. (26) and Bormann (16). In a general discussion of cost factors, Holmes (34) stressed the importance of efficient use of space to lower costs, and Kilham (36) recommended rebuilding rather than remodeling as a general practice if cost of the latter operation would exceed 50 percent of the cost of new construction. He strongly advised against the erection of monumental structures, and suggested the advisability in a period of educational transition like the present of substantial but economical one-story construction which could be amortized and scrapped in thirty years. Long (39) noted the absence of authoritative standards of materials and reviewed a list of materials and other factors which run up costs of maintenance.

Effects of a Developing Education Program

Educational literature has been much concerned with the changing character of the educational program, both horizontally and vertically. There is evidence that this is affecting the character of school building construction in various ways. Available studies point, however, to con-

siderable lag between educational theory and school building planning. Mort and Cornell (42), after studying educational adaptations in thirty-six Pennsylvania communities selected as representative, found that only fifteen could be given a positive score on the item "school plant planning," in that the school building program was the outgrowth of careful study including appraisal of existing plant; studies of utilization, of the nature and growth of populations; and study of the city plan as it affected the school program. Holy (33) observed that scant attention is yet being paid in actual construction to the demands of the community school program and listed the plant requirements of the community school.

Community School

In a comprehensive study of what might be termed initial trends, Engelhardt and Engelhardt (25) summarized building planning revealed by several detailed studies of a nationwide character including: (a) adult and community use of schools organized under the twelve-year program; (b) high-school buildings used by adult and community groups; (c) adaptations in elementary-school buildings for adult and community use.

Fulcomer (27), in a study of plans of forty-five buildings erected with PWA grants-in-aid in all the forty-eight states except those of the Pacific Northwest, reported, however, indications of increasing attention to the educational needs of youth and adults in new building construction. Some of his findings were: (a) thirty-eight plans had space for physical education but only twenty-six had conveniently located shower rooms and in only a few instances could these be shut off from the main plant for adult or evening use; (b) thirty-five had stages large enough for dramatic and choral activities; (c) thirty-two had libraries, eight of which were accessible to adults during the day and twelve had library work-rooms; and (d) twenty-two had dining rooms with kitchen attached, large enough to serve the community. Other facilities of a broader program found with less frequency were shops, music rooms, art rooms, health units, and public rest rooms.

Negro schools—Analysis of a few available plans for Negro high schools by Fulcomer revealed less attention to educational needs of youth and adults, only one out of five having auditoriums or gymnasiums.

Rural schools—Booker reported that thousands of rural districts during the last ten years have replaced, remodeled, or improved rural-school buildings, aided by federal and state grants (15).

Elementary Schools: Trends

In the elementary field, Moehlman editorially summarized construction trends: (a) more planning for the total educational program; (b) development of site as yet inadequate; (c) some evidence of the use of educational specialists in planning; (d) more generalized classrooms; (e) more

functional design—mass, balance; (f) more attention to safety, noise reduction, and improved natural and artificial lighting (46). Engelhardt (24) provided a set of elementary classroom designs representing all the forty-eight states, including several elevations, detailed drawings of special features, architect's notes, and a checklist for designing elementary-school classrooms with full consideration of the physical, social, intellectual, and emotional needs of children. Owen and Stover (50) reviewed factors to be considered in the design of elementary-school classrooms.

Attention to local community needs in planning received attention. Hauser (31) listed the facilities necessary for meeting the needs of underprivileged neighborhoods. The Pittsburgh survey also emphasized the necessity of special provision for underprivileged districts in order that educational opportunities may be equalized (61). Comparing a study made in 1932 of twenty-one sets of plans for elementary schools with a similar analysis of twenty-two plans made in 1939, both having a wide geographical range, Leggett (37, 38) pointed to apparent trends among which are (a) decline in the number of separate auditoriums and increase in auditorium-gymnasium combinations; (b) slightly narrower corridors (10 feet) in 1939; (c) initial trends toward provision of community use facilities, including one community museum—seventeen of the twenty-two plans studied in 1939 provided for kindergartens but no nursery-school facilities; (e) continued specialization of rooms with abrupt transition in facilities from kindergarten to first grade—more classroom floor area in 1939 with eight plans showing workrooms against none in 1932.

Analysis by the writer of eleven sets of plans representative of various sections of the United States exhibited in a national magazine (47) showed as dominant (majority) features: two-story construction; unilateral lighting; unit ventilation and heating; public address systems; electric clock systems; kindergarten-primary-unit grouping of rooms; kindergartens larger than regular classrooms; auditoriums located on periphery of buildings for community use; movable seating; special library rooms; lunchrooms with kitchens attached; special health or nurse's rooms; and teachers' rooms. As secondary features (appearing in three or more plans) there were: one-story construction; intercommunicating telephone or talk-back; sinks or wash basins in individual classrooms; gymnasiums or recreation rooms located on periphery of buildings; workrooms adjoining classrooms or classroom alcoves; one or more classrooms with individual exits or outside classroom terraces; combination auditorium-gymnasium-playrooms; and separate auditoriums. One school was air-conditioned.

In 1940 the National Council for School Building Construction adopted as standard 18 square feet of classroom space per pupil in lieu of the previous recommendation of 16 square feet (45). The Connecticut Code (19) established 25 square feet as the minimum for elementary classrooms. Comparison of the Council's 1940 and 1935 standards (44) also reveal that the 1935 standard of 30-39 running feet of blackboard for elementary-school classrooms has been modified to an amount sufficient for the teacher's

use, and the Connecticut Code (19) "in general" recommended less blackboard than tackboard. Standards for 1940 also call for an elementary site area of 5 to 10 acres, the Connecticut Code 3 to 14 acres.

Reporting the use of makeshift facilities by the WPA in feeding 4,000,000 children during the second semester of 1940-41, Batjer (11) noted that a large number of the schools built or improved by WPA since 1935 provide either lunchroom or cafeteria facilities.

Secondary Schools: Trends

Standards adopted in 1940 by the National Council for School Building Construction (45) include 10 to 30 acres for the secondary-school site, with areas for community use where facilities for recreation are needed and for parking automobiles. The Connecticut Code (19) standards included 7 to 20 acres for sites with recreation, parking areas, and appropriate landscaping. Fulcomer (27) noted the trend toward recognition in secondary-school construction of the needs of youth and adults. Nichols (48) suggested certain unit groupings of rooms in order to facilitate integration of the secondary-school instructional program. Summarizing fifty years of scientific laboratory furniture designing, Campbell (17) noted the current demand for self-performance equipment in units for small groups or individuals. Contrasting with the latter is a demand for economical provision for large classes. Use of waterproof plywood and chemical-resistant hardware was also noted. Similarly on the basis of experience and observation, Friswold (28) listed standards for locker and shower facilities and cited the growing trend toward gang showers for girls. Moehlman (40) noted among industrial arts provisions, trends toward specialized vocational and technical high schools in cities, with programs of instruction and equipment based on individual community surveys.

Simplicity, Flexibility, and Expansibility

Difference of opinion was expressed over the elements of size and permanence of construction. One editorial writer (7) noted both a complaint that in the last three decades buildings have become too large and a reaction against "vast and monumental buildings." Small buildings of economical layout and construction were commended as offering the present best opportunity for solving the school building problem. Another editorial (4) noted that in view of changing populations, changing educational programs, and the rapid appearance of new materials of construction, school buildings have become too monumental, too inflexible in plan and arrangement. Design and construction, it was advised, should be so handled that capital investment will be amortized in twenty-five to forty years. Reference was made to the low cost Parkman School in Detroit, expansible from a small present unit to an eventual forty rooms. Holmes (35) noted that thickness of walls is governed by cold climates, building ordinances of cities, and PWA regulations. Moreover, desirable main-

tenance calls for hard woods in interior finish. He advised against temporary, cheap construction to be written off. The Connecticut Code (19) stipulated that new buildings should be inviting, intimate in spirit, and homelike as opposed to institutional or factory-type appearances.

Safety, Health, and Comfort

Increasing emphasis has been given to provision for the safety, health, and comfort of pupils and teachers. This was in part due to regulations governing construction under federal grants-in-aid (63). Booker noted the recent strengthening of rural-school construction against earthquake hazards, the provision of cyclone cellars, facilities for warm lunches, and improvements in heating, ventilation, and sanitation (15). Under 1933 emergency legislation, California made progress in earthquake protection (29) with state review of plans and advisory service. Trends toward one-story construction, elimination of useless ornamentation, and safer roof construction were noted. Reinforced concrete and rigid steel frames were used to resist earthquake.

Lighting

Hydis (29) noted use of bilateral lighting with shade control with movable furniture, some lighting control by photo-electric cell. National Council on School Building Construction 1940 standards recommended unilateral lighting (45); the Connecticut Code (19) permitted bilateral lighting where movable furniture was used. Tinker (62), after critical examination of research studies on light intensities required for hygienic vision, found errors in some studies calling for high intensities, pointed out the crucial relationships existing between intensities and diffusion, and concluded: (a) where diffusion is unsatisfactory, use 5 to 10 foot-candles; (b) where illumination is well distributed use 10 to 15 foot-candles; (c) if there is no glare, higher intensities may be safely used but without gains in efficiency. The 1940 standards of the National Council for School Building Construction adhered to the American Standards Association recommendations for 1932 and did not accept high intensities (45). As compared with the Council's 1935 recommendations for classroom ceilings, the 1940 standards continue to call for ivory white or light cream but with minimum reflecting factor of 70 percent as against the former minimum of 60 percent. The Connecticut Code (19) called for 10 to 15 foot-candles for regular classrooms.

Playground Surfacing

Cate (18), on the basis of a countrywide survey of surfaces best suited for various activities and grade levels, found use of the various types of surfaces to be in the percentages indicated: natural earth, 37 percent; sand, clay 21 percent; turf, 18 percent; bituminous, 13 percent; crushed stone, 4 percent; Portland cement concrete, 4 percent; and miscellaneous,

3 percent. Cost ranges for the various surfacings were also reported. Cunliff (20) noted that turf is most suitable for large playfields but difficult to maintain on small, concentrated areas or in dry climates; that sand or slag clay is in general use in most cities; that some types of crushed stone produce painful injuries; that bituminous materials are becoming increasingly used; that concrete is more and more used for special game courts; and that use of miscellaneous surfacings apparently depends upon what materials may be available locally.

Teachers' Rooms

Leggett (38), whose study has already been mentioned, reported that more teachers' rooms were provided in the 1939 plans he analyzed than in those for 1932. The writers' analysis of elementary-school plans exhibited in a national magazine (47) revealed a majority of teachers' rooms to be undesignated as regards use by men or women teachers. Teachers' workrooms as well as retiring rooms were called for by the Connecticut Code (19). Ryan in a limited study of teachers' "pet peeves" about buildings (52) reported in order of frequency of mention: (a) lack of storage space; (b) inadequate, unreliable, or noisy ventilation; (c) failure to improve classroom lighting in accordance with current advances; and (d) lack of teachers' rooms. Other objections were listed in lesser frequencies.

Predictions of Future Trends

As announced at the outset of this chapter, some secondary or initial trends have been noted for the benefit of those who may wish to anticipate the emerging outlines of the future on some basis other than that of the crystal ball. To the same end it may not be entirely amiss to include mention of a few predictions which appear to have basis in significant fact, experience, or observation.

The St. Louis survey submitted recommendations looking toward provision for nursery-school-kindergarten-6-4-4 operation by 1950 (60). Among the general recommendations of the Pittsburgh survey (61) were coordination of school planning with city planning; participation of the educational staff in planning school buildings; continued policy of enlargement of school sites; provision for increased community use of buildings and grounds; special variations of the school plant to meet the needs of underprivileged areas. Fulcomer (27) believed that new ideals of architecture will emerge if less expensive materials, the function of the school plant as the principle motivating its architecture, and the expressed needs of the community become the planning constants.

N. L. Englehardt, Jr., proposed a future elementary school which would include the nursery school, kindergarten, and children of the first six grades. He recommended separate housing for (a) the nursery school; (b) the kindergarten-primary units—a group of rooms with a large

covered work-play space; and (c) the upper elementary unit. Also recommended was provision for community recreation and health activities (23). Following the n-k-g-6-4-4 community school concept secondary-school proposals were also made (8) including: (a) provision for an intermediate school of four years; site of 15 to 40 acres with various outdoor educational, recreational, and parking facilities and building designed functionally to serve an integrated program for youth and adults; (b) secondary-school facilities located on a site of 50 to 100 acres, in general similar to that for a small, well-equipped college, including several buildings housing related units; outdoor recreation facilities for adults and students; and development for a community center as well as for an instructional plant.

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CHAPTER VII

Furniture and Equipment for School Buildings¹

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TRUE (70) PUBLISHED AN ARTICLE ENTITLED "Wanted: Equipment Research." The title expressed a need that has existed and does still exist. Setting up standards as proposed by Klehm (37, 38) for industrial arts, or as suggested by Morphet (50), and as is being carried out to an extent (35, 50), is but a part of the research needed. For instance, the use factor hardly has been considered. Certainly, it has not been adequately considered under controlled conditions, taking into consideration such factors as climate, humidity, amount of use, longevity, location with respect to heat and sunlight, and ease of care and repair.

It should be noted that certain items which may be a specified part of a building are in a sense equipment. In this classification come light fixtures, blackboards, public address systems, radios, lockers, showers, toilets, drinking fountains, and door checks. This report does not include many of these items since they are treated elsewhere. In some instances, however, they are included in references cited.

Two excellently prepared and annotated bibliographies have been prepared by Smith and Noffsinger. The first bibliography (66) dealt with college and university buildings, grounds, and equipment. The second bibliography (67) dealt with school buildings, grounds, and equipment. A bibliography on school and college buildings was presented by Leggett (41). In a careful piece of research, Morris (51) listed the various pieces of equipment needed for the auditorium, gymnasium, English, social studies, mathematics, science, domestic science, commerce, shop, language, music, arts and crafts, manual arts, health, audio-visual aids, and student-government activities. Surveys of equipment were made by Larson (40) and Clarson (15).

Zook (76) reported progress in the analysis and development of specifications and standards of school equipment. Working under a grant from the General Education Board and in cooperation with the National Bureau of Standards, tentative specifications have been set up for the folding chair and the removable chair desk and have been issued for study and criticism. In the same report, Zook stated that field work and tabulation of data have been completed in a study of the utilization and distribution of school sanitary facilities and noted the need for a broad research approach to the problem.

¹ Bibliography for this chapter begins on page 207.

Classroom Equipment

Holmes (32) suggested equipment for the modern elementary classroom. An attempt to determine standards of classroom equipment is well represented by two studies which considered current practice, opinions of educators, and "psychological, physiological, and pedagogical demands." The first, by Browne (12), considered Grades I, II, and III. The second, by Moore (49), considered Grades IV, V, and VI. These studies are subject to distinct limitations of conclusions owing to the sampling. The same criticism may be made of Caulton's survey (14) of physical equipment provided for primary children in a single city. Nevertheless, these studies provide data which are of value. The last named study is particularly interesting in that the tables present not only the general classroom equipment but also accessible equipment, and equipment for reading, arithmetic, science, art, writing, music, social science, and housekeeping.

Cunningham (21) gave consideration to the material facilities needed in the training of intermediate-grade teachers in science, made a curriculum analysis, made a firsthand study of the material facilities of seventeen eastern teachers colleges, and secured data by correspondence with educators in twenty-five elementary schools. He concluded that "judging from the findings of the study, it would seem that the curriculum analysis was most valuable in indicating what best procedures should be, since the actual laboratory experiences provided in teachers colleges and elementary schools were in many cases far from the best practice." MacMorris (45) worked out the needed equipment for teaching elementary sciences, Grades I to VI, inclusive, in New York State.

Beatty (6) advocated individual tables and chairs for the schoolroom and much display board. Long (43) reported a study in progress to determine a cross section opinion as to desirable types of equipment for elementary grades, stating that the returns showed a preference (a) for tables and chairs for groups of four to eight for kindergarten and Grades I and II, (b) a mixture of group tables, chairs, and movable desks for Grades III to VIII. Bennett (7) advocated liberal table service in addition to the individual seating arrangement for the pupil. Atticks (3) argued that natural variations of length of arms and legs as compared with the length of trunk in different individuals and at different stages of development of the same individual prevent solution of the seat adjustment problem by establishment of a direct relationship between the elevation of the pupil and the height of the desk above the seat. Fields (23) made a study of elementary-school blackboards. He recommended boards 30, 34, 36, 38, 40, and 42 inches in height for the respective Grades I to VI. He also made a comparison of the qualities and faults of boards of slate, composition, glass, slate cloth, swinging, and reversible.

Special Rooms

While the term "special room" probably will stay in the educational vocabulary for a long time, it should be noted that there is an increasing tendency for rooms of the laboratory type to be multiple purpose rooms. Perhaps the same may be said of rooms of the auditorium, the library, and the office type. Bowers (8), in a rather detailed study of the floor plans of twelve school cafeterias, considered the elements of floor planning, equipment placement, and equipment specifications. The equipment for high-school homemaking departments in schools enrolling up to 150 pupils was studied by Grossoehme (29). Brennen (10) dealt with plumbing for home economics.

Fiester (24) and Willy (73) studied the equipment needs of the general shop. Wilson (74) suggested arrangement and design of shop equipment for vocational agriculture. In the appendix is a list of tools recommended. Katenkamp (36) discussed farm equipment for teaching purposes. Trade training in San Francisco was discussed by Mullany (53).

Crutcher (19) surveyed auditoriums and stages in Kentucky. From an equipment viewpoint, his study is worthy of special note since it is an exploration into an area probably not too well known by administrators. Equipment for combination auditoriums-gymnasiums in small high schools was considered as a part of a study by Watson (72). Adee (2) made a study somewhat similar for a combination music-auditorium-gymnasium room. Friswold (25) dealt with showers and gymnasium lockers. Luehring (44) treated swimming pool construction and operation.

Gibson (26) suggested not only what equipment should be in a social studies laboratory but gave directions for constructing such equipment. Using a checklist technic by which teachers in the several fields expressed preferences, Carroll (13) set up certain recommendations for equipping a combination social science, English, and language room. Martin (47) recommended certain equipment for geography rooms.

Holmes (33) suggested kindergarten equipment. Gilbert (27) discussed library equipment. Hamilton (30) to some extent dealt with equipment in connection with an administration building. Crink (18) studied office equipment in four sizes of high schools. Wilson (74) also treated this subject.

Moore (48), in appraising the health program of a large elementary school, gave consideration to the physical equipment. Roos (62), in his dissertation, presented many excellent tables listing equipment for health service. Roos (63) considered equipment for the health room in a small school, and Nelson (55) discussed the effect of school furniture on health. Martens (46) proposed a layout for a single unit for an orthogenic backward class. Landell (39) recommended equipment for a room for retarded children.

Special Features and Services

While lighting is discussed elsewhere in this issue, individuals interested in research on lighting equipment for the various types of classrooms will find an excellent base reference in the work of Ray (60). He noted that light, lighting, and seeing—all three—must be understood by those who would provide artificial illumination.

Automatic stokers and natural gas in school heating were studied by Myron Anderson. Among other conclusions, he stated that (a) both types of installation create a more uniform cost of heating from year to year than hand-fired coal, and (b) thirty cent gas is about equal to \$5.55-\$5.78 per ton for stoker coal. Napier (54), in a study of twenty-five schools in Oklahoma, attempted "to determine an efficient, satisfactory, and economical procedure in the administration of heating and ventilating equipment in a county and vicinity in Oklahoma."

With the great increase in use of public address equipment, research in that field would seem to offer great possibilities. Guy H. Aynes studied such equipment in Texas schools. In addition to defining terms in this little explored area, he determined the status of public address systems in the state and recommended (a) that in large rooms a special study of acoustical problems should be made before any equipment is purchased, (b) that loud speakers be provided for every classroom in the system, (c) that microphones should be located in places adaptable for work, (d) that recording equipment be purchased, and (e) that before considering the purchase of public address equipment, one should determine definitely that the money could not be used more advantageously for some other device or function of the school. Sigman and Garner (65) appraised two types of motion picture equipment. Bocker (11) recommended desirable equipment for the school radio and public address system.

Recessed lockers have become well accepted. Photo-electric cells for light control are noted. Folding bleachers are looked upon with favor. Articles dealing with equipment for special rooms, primarily, included those of Adams (1), Bates and Pieper (5), Breitenbach (9), Dotzour (22), Gillis (28), Little (42), Persell (59), Reinertsen (61), Smull (68), and Witte and Helble (75). Special equipment, including such an item as an elevator for coal, is reported by Jensen (34) and Stevens (69).

Playgrounds

We are hearing much of physical fitness, or lack of it, on the part of draftees. Increasingly, there is a shift of responsibility to the school for exercise and recreation of youth and adults. Therefore, it would seem that information as to equipment for specific purposes and for various stages of development is needed to a constantly increasing degree. Warden (71) suggested the amount of equipment needed for games and recreational activities. Austin (4) surveyed playground areas and equipment of certain

rural schools and recommended equipment for schools having enrolments of less than, and more than, 400 pupils. A study confined to a limited area, but which is suggestive of needed studies, is that of Seger (64), who delved into the matter of an adequate building and recreation field suitable to the needs of a revised program in health and physical education for a New York normal school. O'Keefe (57) advocated making games such as can be played at home and recommended certain apparatus. Peavy (58), on the other hand, was concerned with the misuse and repair of equipment. Crawford (16, 17), Cunliff (20), and Hardy (31) have all dealt with the subject of playground surfacing.

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CHAPTER VIII

School Lighting¹

WILLIAM O. ENGLE

SCHOOL LIGHTING is not a new problem to educators. Although, as reported by Noffsinger (30), glass windows in school buildings were rare as late as 1820, natural light was utilized to some degree, and by 1847 the first use of unilateral lighting appeared in Boston. By 1868 the value of high windows was recognized, and in 1874 the New Jersey Department of Education recommended windows with square heads. The window-floor ratio seems to have been first determined in 1877 when a window area equal to 10 percent of the floor area was recommended, but prior to that time Kiddle and Shoem had called for 200 square inches of window area for each child. Between 1879 and 1889, the glass-floor ratio varied from 15 percent to 50 percent and, during this same period, factors for determining the width of a room were appearing.

It was generally agreed that no desk should be a greater distance from the nearest window than $1\frac{1}{2}$ times the distance from the floor to the top of the window, and curiously enough, this rule is still in use in many states today. That the intensity of light required for doing visual work might be determined was first suggested in 1888. Since 1900, more and more attention has been given to light intensities, and with the advent of accurate light measuring devices, more positive steps have been taken.

Natural Lighting; Windows

As reported by Seymour (34), natural lighting “. . . tends to receive less attention partly because no one can make a commercial profit out of it.” Taylor (37) has observed that natural light in the classroom may depend on weather conditions, architectural design, fenestration, or on window shades. Hamon (15) and Eckles (10) recommended that classroom windows face either to the east or west, but Gradle (12) called for a northeast or northwest exposure. Naturally, the desirable exposure will vary slightly in different geographical locations, but no scientific and experimental data in support of any such recommendations have come to hand.

Ives (21) stated that in 1928 two-thirds of the schools which reported specified unilateral lighting as being the most desirable. This specification has had the support of many interested parties, and it was not until 1937 when Harrison and Fouilhoux (18) presented their arguments that bilateral lighting was given much attention. These architects analyzed the

¹ Bibliography for this chapter begins on page 219.

problems by presenting a set of arguments in favor of both types of window location. Seymour (34) called attention to the fact that increased intensities can be obtained by borrowing light from the corridor side of the classroom, but this assumes that the corridor has some source of natural light. Harrison and Fouilhoux (17) diagrammatically proved that many of the doubts concerning bilateral windows can be dispelled by the less rigid seating arrangements made possible by the movable desk.

Since 1877, when a window-floor ratio was first determined, there has been a wide range of figures covering this rule. These figures have varied from 10 to 50 percent, but by 1930 some stabilization had been reached when Hopkinson (20) reported that two states followed a ratio of $16\frac{2}{3}$ percent, thirteen states used 20 percent, and two states 25 percent. Recent recommendations continue to show a similar variation, with Harrison and Fouilhoux (16) advocating not less than $16\frac{2}{3}$ to 20 percent, a Committee on Standards for Lighting Sight Saving Classrooms in Ohio (32) 20 percent, and a top figure of 25 percent recommended by two writers, Gradle (12) and Hamon (15). That such a ratio may not be satisfactory is pointed out by Harrison and Fouilhoux (17) in stating that "... with a window ratio of 20 percent, the intensity on the far side of a room is frequently less than 5 foot-candles on a bright day."

That no window should extend below the top of the pupil desk level has been a generally accepted rule, but Harrison and Fouilhoux (17) suggested that "... a second floor classroom does not require a sill as high as that required in a first floor classroom to render a single source of glare invisible." Such a deviation will permit an increase in natural illumination, permit the pupils to enjoy an outside view, and allow a greater flexibility in architectural design. It is further recommended by them that the soffit of the window head be raised to within 1 or 2 inches of the ceiling if construction permits, that the formerly blank wall beyond the front row of desks be utilized for natural lighting, and that mullions be less than 12 inches wide and evenly spaced.

Six types of windows are the double-hung, the casement, the projected, the horizontal pivoted window, the sliding or sinking window, and the fixed window are mentioned by Harrison and Fouilhoux (16). In choosing a window type they listed twelve considerations.

Except for those undesirable areas where pupils may be required to face the windows, a drawn type of clear glass with a high factor of light transmission should be used. Jackson (22) and Harrison and Fouilhoux (16) have pointed out the possibilities of using a prism glass near the top of the window for the purpose of directing the light rays to the far side of the room, but for the present, at least, this type of glass is too expensive for general use. Regardless of the type of window used, or the quality of glass in these windows, it is highly essential that the glass be kept as clean as possible. Seymour (34) found that dirty windows may reduce the light at the window by as much as 65 foot-candles, and at a

distance of 12 feet from the window the light may be reduced by as much as 15 foot-candles.

Hamon (15) stated that the "... misuse of window shades has resulted in the permanent injury to the eyes of thousands of American school children." Most authorities agree that the shades should be translucent and operate from the center of the window so that it will not always be necessary to cut off the light from that all important top portion of the window area. The Venetian blind is attractive and somewhat effective but is usually supported at the window head which does not permit the flexibility of the dual shades supported at the middle, and it cuts off top light when pulled up. Regardless of the type used, the color should be light so that the reflective factor will be high.

Skylighting has received little attention from school architects and lighting experts in recent years, but Hamon (15) stated that when used it should be of the saw-tooth type and face north so that the direct rays of the sun will not shine directly on the working plane of the pupil. Most writers agree that many of the lighting difficulties, natural and artificial, can be materially lessened by the use of the movable seat and desk. A survey by the teachers of the John H. Francis Polytechnic High School in Los Angeles, California (28), revealed to those with poor vision the advantages that a shuffle in the seating arrangement can bring about.

Intensity of Illumination

The central issue in the question of light in the classroom seems to be, How much light? As Noffsinger (30) has said, "It has only been since 1900 that the problem of scientifically determining the light intensity required has been considered, and even by 1928 only a few schools had recommended standards for artificial lighting." It is natural that much of this work should have been pioneered by the Illuminating Engineering Society, but it is regrettable that more work of an original nature has not been turned out by individuals and organizations with nothing to sell. Consumers' Union (3) reported that half of the sustaining members of the I.E.S. are power companies, and it is only natural that school administrators, interested in keeping their costs as low as possible, should view with alarm the greatly increased recommendations of the American Standards Association which have been made during the last ten years. The recommended intensities have, in many instances, been tripled, and present indications seem to point toward even higher intensities of illumination.

Halsey (14) estimated that the revision from the 1932 minimum standards to the proposed standards of the I.E.S. for 1938 would cost the nation \$22,500,000 for additional current alone. The Electrical Division of the New York City Board of Education's Bureau of Con-

struction and Maintenance (27) estimated that the recommended increase in lighting would cost the nation around \$15,000,000. We have not, as Halsey (13) has said, been able to "determine what are the lowest intensities of properly distributed and diffused artificial light that can be used in various parts of a schoolhouse to provide conditions for correct visual acuity and prevent deleterious effects on the eyes of the users of the schoolhouse."

Needs Expressed in Watts

A number of lighting engineers have calculated the lighting needs of the classroom in terms of watts per square foot of floor space. Lebenshon (25) stated that in a light colored room from 1 to 3 watts of indirect light per square foot will give from 10 to 30 foot-candles of illumination. Hamon (15) suggested 2 watts per square foot, while the American Standards Association (29) and the National Electrical Manufacturing Association (36) recommended 4 watts per square foot for classrooms but varied the wattage considerably for other parts of the building. A summary of their recommendations follows:

MINIMUM WATTS PER SQUARE FOOT OF FLOOR AREA

	<i>American Standards Association</i>	<i>National Electrical Manufacturing Association</i>
Classrooms	4	4
Libraries	4	6
Offices	4	5
Sewing, drafting, detail rooms	7	7
Shops, laboratories	4	3
Gymnasiums	4	3
Auditoriums	2	2.5
Locker rooms	1	not given
Cafeterias	2	2.5
Corridors, stairs	1	not given
Toilets	1	1
Sight-saving rooms	8	7

Seymour (34) noted that lamps should be operated at the correct voltage; a drop of 5 percent in voltage will result in a decrease of approximately 17 percent in lamp output. The voltage of all schools should be carefully checked under full load so that all lamps may receive the correct voltage. Councill (5) pointed out that as new installations calling for an increase in wattage are considered it is necessary to check carefully the existing wiring, panel boxes, transformers, and transformer boxes. He recommended a number 12 or even the heavier number 10 wire in place of the light number 14 so frequently found in the earlier installations.

Experimental Studies of Light Intensity

Layton (24), in a study of two fourth grades with balanced IQ's, found that the experimental group, working under indirect light with a minimum intensity of 12 foot-candles and a maximum of 15 foot-candles, made greater academic progress in reading than did the control group. In reading, the control grade showed a gain of 2.1 percent as against 16.3 percent for the experimental group; in reading comprehension the control group gained 8.5 percent while the experimental grade improved by 21.0 percent. In arithmetic the reverse was true. The control grade gained 8 percent against 4 percent for the experimental grade. Tinker (38) found that after a 2-minute period of adaptation the average person was able to read no faster under 17 foot-candles than under 10, nor were the individuals tested able to show any appreciable gain under 53 foot-candles. When given a 15-minute period of adaptation, his statistics show that the reading rate will be the same for intensities of 3 foot-candles and 10 foot-candles. As a result of this study he concluded that "when the eye is adequately adapted to the light intensity under which it is to work, the critical level for effective seeing is at about 3 foot-candles or slightly below." In another study by Tinker (40), he refuted the earlier studies by Albert (1), Allphin (2), Dates (9), and Johnston (23), in which they cited academic gains to be had from greater light intensities. He found that the difference in brightness had no effect on school achievement, and that the American Recommended Practice of School Lighting is based largely upon conclusions derived from misinterpreted results. Tinker (39) further stated that ". . . instead of preferring 100 foot-candles as suggested by Luckiesh and Moss, 5 to 10 foot-candles are chosen when the eye is adapted to the illumination ordinarily found in homes and offices. None of this evidence indicates that ease and comfort in reading is increased by exceedingly high intensities of light."

Lebenshon (25) stated that a high illumination produces stimulation and attention whereas subdued lighting produces restfulness and inactivity. He recommended a minimum of 10 foot-candles for reading. Viles (41) pointed out the necessity of considering the long-time effect of high pressure activity (which is supposedly possible under great illumination) on the nervous system of the child. Flagler (11) objected to indirect light because of its cold quality and lack of "eye appeal" and for this reason preferred the semi-indirect luminaire.

Recommendations for Further Study

Halsey (14) said that we need experimentation by ophthalmologists, educators, and engineers rather than statements by I.E.S. men working for the power industry. Loos (26) suggested that ". . . the whole problem of school illumination would be a proper undertaking for some

foundation concerned with education. The unbiased findings should create an economical and hygienic basis for determining how much illumination is needed for the physical and educational good of children." Tinker (40) called for some unequivocal experimental evidence and believes that such statements as "higher values will contribute to greater accuracy, speed, and ease" should be dropped until they can be supported. Consumers' Union (3) wrote that "... at a time when advertising associations and super-patriotic commercial groups are spending a great amount of energy beating the drums for an investigation of school textbooks which criticize advertising, it would seem proper to suggest that someone look into utility propaganda in schools for larger electric bills." Viles (41) expressed the opinion that the "acceptance or rejection of the proposed standards or adoption of substitute standards can best be qualified by additional controlled studies where benefits and costs are carefully evaluated."

Glare

Glare has been defined by Dr. M. Luckiesh of the Nela Park Laboratories of the General Electric Company as "that factor in the lighting situation by which a bodily disturbance arises, characterized by expressions of discomfort, distraction, irritation or pain, which are referred to absolutely or relatively high brightness in the visual field." L. S. Ickis of the General Electric Company divides the condition into two parts: "direct glare, which is measured in candlepower at the eye emanating from light sources, and reflected glare, which is largely a matter of brightness contrast superimposed on the seeing task." Eckles (10) has defined glare as "any brightness within the field of vision of such a character as to cause discomfort, annoyance, interference with vision, or eye fatigue." Glossy finishes cause reflected light glare whereas direct glare is such as looking at a window opening toward a bright sky. A number of ways of measuring glare have been suggested. The Lancaster pencil-shadow test calls for a pencil held parallel to a piece of paper about 3 inches above the surface of the plane on which the paper is resting. The paper should be so placed that the light will fall perpendicularly upon it. If the light is well diffused the shadow of the pencil is very blurred, but if the shadow is clear-cut the light is not well diffused but concentrated and not agreeable for reading. Flagler (11) says that the amount of glare can be measured by the sharpness of outline of the illuminating unit on the mirror effect of a polished table top.

Glare indoors is, as a rule, not the result of too much light but rather a result of poor distribution. The light should be so widely diffused that almost no shadows are cast by it. Oday and Sturrock (31) have said that "... we accept the principles of higher illumination, but question the advisability of attempting to reach these levels without properly designed fixtures to prevent bright spots and glare."

Most schools are, at the present time, using an incandescent source of artificial illumination with one of the three types of luminaire: semidirect, semi-indirect, or indirect. The semidirect luminaire, usually a frosted glass globe, permits a large percentage of light from the source to shine directly on the working plane with only a small portion of the light being reflected from the ceiling. The semi-indirect luminaire, usually an opaque plastic or glass, throws the greater percentage of the light on the ceiling from where it is reflected to the working plane. The indirect luminaire reflects the light from the source onto the ceiling permitting no direct rays on the working plane. The semi-indirect and indirect luminaire offer the distinct advantage of considerably reduced glare but require an appreciable increase of source intensity to give an equal foot-candle rating on the working plane. Studies by Palmer (33) and Halsey (13) emphasized this fact.

Realizing that glare from the semidirect luminaire can be minimized by using globes that are sufficiently large, Palmer (33) worked out the following table:

<i>Size of Lamp</i>	<i>Globe Diameter</i>	
	<i>Minimum</i>	<i>Maximum</i>
150 Watts	12 in.	14 in.
200 Watts	14 in.	16 in.
300 Watts	16 in.	18 in.
500 Watts	18 in.	20 in.

A series of experiments by Seymour (34) suggested that the glass globe that is almost spherical in shape gives the greatest output of light.

Fluorescent Lighting

One possible means of improving lighting intensities without increasing wattage is the recently perfected, and commercially popular, fluorescent source of light. This lamp consists of a glass tube with a filament type electrode at each end. A mercury vapor in the tube produces ultraviolet rays when the electrons flow between the electrodes, and it is the action of these ultraviolet rays on certain phosphors contained in a coating on the interior of the tube that produces the light. Consumers' Union (3) reported that a 60-watt incandescent bulb is required to give an illumination equivalent to that provided by a 15-watt fluorescent tube. The initial cost of the fluorescent tube is greater but its life is estimated to be almost double that of the incandescent bulb, since the diffusion area is about ten times that of a similar output in an ordinary electric bulb, the result is a relatively shadowless illumination. A stroboscopic effect is noticeable when a single tube is used, but it can be practically eliminated by the flicker-corrected two lamp fixture. To eliminate the possibility of glare, Loos (26) suggested the use of glass plates, shields, or louvers on the luminaire. Darley and Ickis (8) listed four items to consider before switching from the incandescent source to the fluorescent source.

Color and Absorption

Lighting is dependent upon the cleanliness of luminaires, walls, and windows. Street (35) recommended an off-white paint for ceilings with a matt finish surface and a flat, pastel green paint for the walls. Councell (5) suggested flat, white ceilings and walls of a pastel grey, green, tan, or blue, with dadoes in darker harmonious shades of semigloss paint. Hathaway (19) mentioned a warm, buff paint in a room with a northern exposure, soft greys or blue-greens for the sunny room, but warned against the use of yellow, which is a source of fatigue. In any event it is highly essential that a paint be chosen that has a high reflective factor and a lack of glare. Most paint companies will gladly quote the absorption factor and percentage of reflection to be expected from their various colors and types of paint.

Flagler (11) noted that the illumination from lights near the blackboard is always less than in other parts of the room because black will absorb light so heavily. A study by Darley (6) revealed that when an average intensity of 20 foot-candles is provided on the horizontal plane it may be necessary to supplement the illumination for the blackboard as the illumination received on the vertical plane is only one-half to one-fourth as much as is received on the horizontal plane. He recommended a recessed, parabolic-cylindrical type of fixture for this purpose as it throws the light directly on the board surface. Harrison and Fouilhoux (17) pointed out that the blackboard will cause a decrease in intensity of illumination where it is most needed. Although an intensity of 5 foot-candles might be present at the wall, the blackboard might absorb as much as 90 percent of it, leaving only $\frac{1}{2}$ foot-candle. It has been recommended that blackboards be provided with a light colored shade that can be drawn when the boards are not in use, thus providing a surface of greater light reflective power.

Location of Light Sources

That the location and spacing of the luminaire is more than just a matter of architectural chance and convenience is a fact that has been recognized for some time. Darley (7) suggested that ". . . in no event should the spacing exceed the distance from the floor to the ceiling or the space between units and side walls exceed one-half of the distance between the floor and ceiling." Sturrock (36) recommended a spacing ". . . not greater than $1\frac{1}{2}$ times the distance from the bottom of the lighting unit to the top of the desk top." When the indirect luminaire is used, he found that the maximum spacing may be increased about 2 feet over the above rule.

Control of Classroom Lights

It is generally agreed that the two rows of lights in classrooms should be independently controlled so that the inner row may be put into use

during those periods when it may not be necessary to operate the row nearest the windows. The mechanically operated control which utilizes the photo-relay system is receiving considerable attention at the present time. An "electric eye" automatically turns on the lights when the intensity of natural light falls below a predetermined foot-candle rating and automatically turns the lights off when the natural light becomes more intense than the artificial light in the room. A manual control is maintained so that the system may be disengaged during those periods when the room is not in use. Cornet (4) described a building where several similarly located rooms are adequately controlled by the same photo-relay system. Hamon (15) has found that most of the experimental installations of automatic control are too sensitive, and that they switch the lights off and on too often. Eckles (10) is of the opinion that the relay control system would be more satisfactory if it were so designed that it would maintain a minimum light supply by gradual increase in intensity with decreases in natural light. Once the technical difficulties have been removed, the photo-relay system should offer an excellent way of unifying classroom illumination and at the same time substantially reduce waste resulting from the needless use of electrical energy.

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CHAPTER IX

Bonds To Finance School Buildings¹

FRANK P. BOGLE

A LARGE PORTION OF THE LITERATURE pertaining to school bonding is to be found in connection with municipal bonding. There has been a considerable number of accounts written which are descriptive of successful bonding campaigns or suggestive of trends and best practices. These, however, would hardly be classed as research. One of the first primers on bonding which has been considered basic in the field was Fraser Brown's *Municipal Bonds* (1). Even though it dealt with municipal bonds, most of the content was equally adaptable to school bonds. The study considered the bond as a negotiable instrument, types of maturity, the sale and award, validation, and the functions of the attorney. Fowlkes (7) in 1924 made a study of the entire area of school bonds. He covered all the phases of the bonding program—justification, marketing, retirement, and bond accounting—and included the public relations aspect as well by suggesting many campaign devices and materials. Different kinds of bonds were described and their relative advantages and disadvantages pointed out. Clark and Royalty (4) studied the effect of broad seasonal swings in the bond market on the timing of offerings and the accuracy with which trends could be predicted. Halsey (9) also studied seasonal fluctuations in the bond market and criticized the bases of the Clark-Royalty predictions.

Garvey (8) studied the legal requirements in the various states on school bonding. The state laws dealing with the purposes, authorization, debt limitations, sale, refunding, and redemption were presented in tabular form. Smith (14) surveyed the debt limitations in all the forty-eight states—the amount of the limitation, its base, and its source, whether statutory or constitutional—and drew comparisons by reducing them to a common denominator. The study contained the pertinent extracts from the school codes of all the states. Complete tables set forth various state bonding regulations with reference to the kinds of bonds, maximum duration, vote required, type of sale, minimum sale price, and maximum interest rates.

In 1927 Chamberlain and Edwards (2) published a revised edition of their scholarly and frequently quoted text dealing with all types of bonds. This was written from the investment standpoint. The first part contained a basic treatise of bonds as investments and also a classification of bonds as to the obligor, the security, the purpose, and the conditions attending payment. Part Two discussed civil loans—their nature, history, security, and validity. During the same year Engelhardt and Engelhardt's *Public School Business Administration* (5) made its appearance and continues to be the school administrator's most common reference. Its section on school bonds considered the kinds, life, authorization, and sale. A complete bond trans-

¹ Bibliography for this chapter begins on page 223

cript was included as well as suggested accounting forms. The Investment Bankers Association of America (10) issued a statement embracing their suggestions for sound and economical procedure in the issuance of bonds. Their recommendations were embodied under four sections: safeguards through constitutional or legislative enactments, purposes and form of bonds, sale of bonds, and financial condition and operation of the municipality.

The merits of bonding as a means of financing capital outlays were weighed against pay-as-you-go by Essex (6). Such factors as spreading the costs of school buildings over a period of years in order to reduce the present subjective burden on taxpayers and to permit those people who derive the benefits to share the costs were measured against the dangers of imposing upon the future an ever increasing debt load. Kirshman (11) in evaluating different methods of financing long-term improvements pointed out the disadvantages of serial bonds as well as their advantages. The inflexibility of serial bond payments has, through the exigencies of the depression, resulted in many of the bond defaults. In addition, redemption of sinking fund bonds in the open market could often be effected at a considerable saving. Some of the economies which may be effected through intelligent debt management were described by Linn (12). The advisability of resorting to bonding was considered along with the pay-as-you-go plan. Types of bonds were described as were the factors affecting bond rates. The relationship which should exist between interest rates and the duration of issues was discussed and recommendations were made for the coordination of short-and-long-term loans in the financing of school buildings by bonding.

During the 1930's unprecedentedly low interest rates and financial difficulties put a somewhat different light on the practice of refunding and the advisability of issuing only callable bonds. Practices in bidding have undergone some changes and serial bonds have come to be required by law to an ever increasing extent. Doubtless the most significant work which has appeared in recent years embracing these factors was under the authorship of Chatters and Hillhouse (3). The steps in the issuance of bonds were considered chronologically in great detail. Methods of computing the margin of debt-incurring capacity, conducting the sale, computing the best bid, and the preparation of the bonds were given elaborate treatment. Forms for use in bond accounting were exemplified and explained. Sinking fund administration, voluntary refunding operations, and the formulation of a debt policy were studied from the standpoint of sound debt administration.

Rightor (13) surveyed the debt situation—national, state, county, and school—up to 1940. Trends, comparisons, and regional distributions were described and tabulated. The relative effect of the proposed termination of reciprocal tax exemption of governmental securities on state and local incomes as compared to federal incomes was illustrated. He showed in what governmental subdivisions the greatest reductions as well as increases in bonded debt occurred.

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CHAPTER X

Cost of School Buildings¹

N. L. ENGELHARDT, JR.

SINCE 1938 ONLY A FEW MAJOR STUDIES of school building costs have been made. Two of the most comprehensive studies are related to analyses of the costs of fifty-two school buildings built in New York State between 1930 and 1937. In this group were eight elementary, six secondary, and thirty combined elementary and secondary schools. The plans, specifications, and cost data were analyzed in great detail and the results published in two volumes. The major findings of the first of the studies, that by Engelhardt (4), are as follows:

Variations in the plan types of the buildings, as measured by relationships of perimeter, ground area, and cubic contents, were significantly related to variations in general construction costs per cubic foot. The cost per cubic foot of a small one-story structure, with open type plan, was estimated to exceed the cost per cubic foot of a large two-story square building by 10 cents per cubic foot. Buildings with auditoriums above gymnasiums cost 1.2 cents more per cubic foot than buildings with these units located on the ground floor level. The changes in ratio of perimeter to cubic contents were more influential than changes in the ratio of ground area to cubic contents in determining the variations in general construction costs per cubic foot.

The average flat roof, steel-frame building with face brick and tile exterior walls and tile interior partitions costs 2.3 cents per cubic foot less than flat roof, wall-bearing structures with face and common brick exterior walls and brick or tile interior walls. Buildings with flat concrete or gypsum slab roofs on steel frame averaged 2.5 cents per cubic foot more in general construction costs than buildings with gable or hip roofs on wood frames with slate covering.

Average differences in general construction costs per cubic foot as large as 4.2 cents were found between buildings with different types of interior finishes.

A formula for the prediction of general construction costs of similar buildings was developed in terms of the habitable space, auditoriums and gymnasiums, and non-habitable space. This formula had a multiple correlation coefficient of .98.

Variation in the percentages of total space devoted to educational functions was found to be large. It was found that on the average only 41.5 per cent of the total building cubic contents was devoted to instructional and general educational units. The indications were that certain architects designed buildings with higher percentages of educational space than others.

Plumbing and electrical service costs per cubic foot had standard deviations of 0.5 cents, indicating that these items had small influence on variations in the total costs per cubic foot of the buildings included in the study. The total costs of these services were largely influenced by the costs of fixtures.

Fees for architectural services varied from 4.5 to 8.5 per cent of the total cost of general construction, heating and ventilating, plumbing, and electrical work. An analysis reemphasized the well known fact that certain architects charged smaller fees than others and that the schedule of charges established by the American Institute of Architects was not adhered to in all cases.

¹ Bibliography for this chapter begins on page 226

In the second of the studies, Bormann (3) showed the folly of continuing to make comparisons of school building costs solely on the basis of cost per cubic foot and the advantages of using several other units of cost as bases for comparative cost studies. Cost per cubic foot of educational cubature, cost per square foot of educational floor area, and cost per weighted pupil station were found to be the best units to use for comparing school building costs in terms of their educational serviceability. A building which appears inexpensive because it has a low cost per cubic foot may really be expensive, because only a relatively small percentage of its cubature is available for use. The method of weighting pupil stations which was developed makes it possible to express different types of pupil station, such as those found in gymnasiums, auditoriums, libraries, laboratories, and shops, in terms of an ordinary classroom pupil station. The weighting is based on ratios of cubature and cost. It should be noted that the group of buildings studied is not a random sample of all school buildings in the United States. Many of the buildings in other states are built under varying physical conditions and are designed to fulfil different educational needs and programs. The New York State buildings used in this study are, however, reasonably representative of current school building construction. They conform to accepted standards of safety and sanitation. They are attractive in appearance and sound in construction. It is, therefore, reasonable to assume that units of cost and measures of building size or capacity found suitable for these buildings may be helpful in studying the costs of other groups of school buildings erected in recent years.

In Bormann's opinion (3), comparisons of school building costs should, as a rule, be made in statewide studies. In such studies, unit costs are little affected by differences in legal requirements governing building construction or the educational program. Even climate is fairly uniform in its demands on building construction within each state.

Herber (5), in a study of influence of the Public Works Administration on school building construction in New York State, analyzed costs of school buildings built between 1933 and 1936. A comparative study of nine representative communities indicated a median increased cost of 9 percent due to PWA requirements. General construction contractors reported a median increased cost of 7.8 percent; heating and ventilating contractors reported an increase of .75 percent; electrical contractors reported an increased cost of 3 percent; plumbing contractors an increase of 4 percent; and architects an increase of 5.6 percent because of PWA regulations. The increases in costs were attributed by contractors to PWA requirements regarding local labor, federal reports, thirty-hour week, wage rates, and double shifts for workmen. They reported that delays in approval of changes and extras, decisions of the resident engineer, and delays in payments of federal monies also contributed to the increases in costs.

Holmes (6) discussed the possibilities of economy in school building construction. Wheeler (7) gave some suggestions for reducing structural

costs. He discussed the commonly used systems of floors, frames, and economies which might be made. To encourage such economies, he recommended that:

Those who have the hiring of architects and engineers to plan and supervise the construction of school buildings can encourage their efforts to reduce building costs if they will see that their compensation is adequate and that their fees are based on the amount of the appropriation rather than the actual cost of the building. If this is done, architects and engineers will not be penalized when they save money for their clients.

The *Architectural Record* (1) reported the construction of an elementary school at Fairfield, Connecticut.

In determining type of construction the architects found State school authorities more concerned with circulation and exit facilities for one-story schools than with "fireproof" construction. Hence, plywood was selected. Upon being assured that plywood could be conveniently overcoated, local authorities accepted the architects' recommendations—on trial. Reports now indicate great local satisfaction. In this school was used a patented plywood joint, invented by Oscar Fisher, which makes erection of plywood interior finish fool-proof. Cost 20.5 cents cu. ft.

In design, both architectural and educational, the school is well advanced. The basic unit . . . is a flexible classroom in which are included study alcoves, small libraries, storage closets, work counters with sinks and flexible seating arrangements which permit the children to organize under their own leadership while the teacher supervises the class without bossing it. Interiors of all classrooms are plywood, floors are asphalt tile applied directly to a concrete slab. Thorough ventilation is assured by the use of projected casements and an exhaust system which takes used air through the coat lockers and out to the roof.

The U. S. Office of Education (2) recently made a study of the possibility of demountable construction of school buildings, utilizing prefabricated building materials.

Further research into costs is essential if school buildings are to be maintained at a desirable level of efficiency. Many older sections of our cities have need for new buildings. Under present economic conditions these cities find it extremely difficult to replace their older structures. Similarly, communities with low-cost housing frequently find it impossible to finance the construction of typical forty to fifty cent per cubic foot school buildings. The relationship between initial cost and maintenance has not as yet been adequately treated. The possibility of building nonfire-resistive one-story buildings has not been given sufficient consideration as an alternative to the two or three-story highly fire-resistive construction.

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PART III

CHAPTER XI

Maintenance and Operation of School Buildings¹

LELAND W. MOON

Personnel

VILES (91) DISCUSSED THE SCHOOL JANITOR and his job. He made suggestions for improving janitorial service, listing certain miscellaneous duties of the janitor. Buros (8) listed four types of maintenance jobs that have been performed by the custodian. They are (a) preservation of floors, (b) rehabilitation of buildings, (c) decoration of walls, and (d) making stage scenery. Jongens (40) also listed jobs to be performed by the maintenance employees. The St. Louis Survey (84) made recommendations for setting up a personnel division to obtain better inspectorial service and better coordination of building service workers. Young (96) discussed salaries of custodians as compared to salaries in industry and mentioned the effect of rising labor costs on obtaining better workers for custodians. The Pittsburgh Survey (83) advocated the maintaining of a permanently employed minimum crew of maintenance workers at a reasonable monthly wage.

Work Programs

Brown (6) advocated a combination of staff and contract method of making school building repairs. Viles and Carpenter (92) mentioned the use of a school janitor for certain maintenance jobs. Allen (3) stated that the members of the maintenance staff in most school systems, although good handy men, could not be expected to do types of repair work that involve technical skills and that it would be wise to segregate such items and let them out by contract. Stouffer (82) reported the use of a small special crew of carpenters, painters, glaziers, and plumbers for maintenance work. Clemons and Johns (10) emphasized the importance of continuous maintenance work. Park (63) believed the school should serve as an inspiration to the community to care for all public property.

Engelhardt (18) and Watson (94) reported the use of a maintenance clinic. Engelhardt (18) gave 115 suggestions to be considered before specifying the construction of new school buildings. He listed them under the following four headings: (a) general, (b) plumbing, (c) heating and ventilating, and (d) electric wiring. McDermith (54) developed a checklist for determining maintenance needs. The subcommittee on electric and elevator systems of Building Manager's Association of Chicago (85) suggested an elevator maintenance schedule of daily, weekly, semimonthly, monthly, quarterly, semiannual, and annual inspections. Hemenway (32) asserted that modern school maintenance is not a handy man's job; the

¹ Bibliography for this chapter begins on page 233.

custodian should do only emergency repairs. He stated that it is necessary for the administration to set up rules clearly differentiating the functions of operation and maintenance employees. Morphet (58), in a survey of the schools of Dade County, Florida, expressed a need for more planning of custodial work. Viles (91) presented a plan for developing a work program and organization of janitorial service.

Economy in Maintenance

Long (50) advocated the use of better materials for lowering maintenance costs, but expressed regret that authoritative standards for materials do not exist; however, he indicated a preference for certain materials as tile over plaster, terrazzo over concrete, and copper over steel pipe. Hill (34) listed six types of material which he considered attractive and which contribute toward reducing maintenance costs to a minimum. Morphet (58), in a survey of the schools of Dade County, Florida, reported a need for more emphasis on maintenance, particularly on the study of maintenance costs in relation to construction weaknesses and difficulties. Holmes (37) stated that the demands for good maintenance dictate the use of hard woods for interior trim, of a good grade of hardware, plumbing fixtures, floor finishes, plaster, and painting. Newman (61) gave suggestions for reducing operation and maintenance costs. He suggested the lowering of insurance costs by a maintenance program to eliminate fire hazards. Hem-enway (32) advocated the use of the maintenance employees to provide certain types of school equipment, such as cupboards, open shelves, and wall shelves; however, he cautioned against competition with efficient supply houses.

Rehabilitation

Smith (79) reported the successful programs of rehabilitation of four counties of four southern states. He gave data on the extent of participation of WPA and PWA in school building construction. Nelson (30) made suggestions for rehabilitation of old buildings to eliminate fire hazards. McLain (55) suggested the appropriation of a definite percentage of the value of the plant for its renovation. Lewis (47) listed six categories of repairs and gave a program for summer renovation. Allen (3) advised the rehabilitation of the heating system at the close of the school year. Kirk (41) reported the use of PWA to good advantage in the modernization of old school buildings under seven categories. Gay (26) discussed the influence of WPA on school building standards, stressing safety, fire protection, and maintenance to prevent depreciation.

Maintenance of Grounds

O'Brien (62) and Friswold (23) made suggestions for the maintenance of school grounds. O'Brien (62) listed eight items to be considered in

maintaining grounds. He stressed the importance and educational value of maintenance of grounds. Smith (80) believed that landscaping activities contributed to better citizenship. Long (51) discussed drainage, terracing, and landscaping of school grounds.

Equipment: Care and Handling

Koopman (44) presented a plan for the management of school equipment covering items such as selection, financing, bidding, procedures, testing, storage, repair, insurance, and accounting. Burke (7) also presented a plan for the care of school equipment, not including built-in equipment, in which he advocated a permanent, continuing inventory. He considered a card inventory more flexible. Morphet (57) warned against the purchase of faddist equipment and suggested cooperative procedures for small schools. Hoff (36) made suggestions concerning selection of equipment. Ernst (20) stated that use or performance is the best method of testing supplies and equipment. He cautioned against being too specific in unimportant details of specifications. Lamb (45) discussed the use of both centrifugal and vertical pumps. Reagle (67) gave detailed instructions for the care of tools and machines preparatory to their storage for the summer. Band uniforms, musical instruments, and athletic equipment were included.

Public Health Nursing (72) asserted that the hazards arising from neglect of safety measures in schools may be as great as those in industry. Specific mention was made of manual training shops, faulty electric wiring, steam boilers, and safety valves. The St. Louis Survey (84) suggested the purchase of electric motor-driven scrubbing, polishing, and steel-wooling machines to simplify floor cleaning operations. Bursch (9) described inadequate buildings which were equipped with poor furniture and generally lacking in modern hygienic equipment. Deardorff (16) stated that improvements in plant equipment would improve educational results and advocated truly modern buildings and the alteration of existing poor buildings.

Depreciation and Obsolescence

Poruben (65) made an analysis of the causes of depreciation of school properties. He gave three causes: (a) physical, (b) functional, and (c) contingent. He also listed five principles and gave procedures for computing depreciation and calculating annual depreciation allowances. Hermann (33) gave an illustration of the point at which obsolescence makes replacement justifiable or necessary. Adams (1) presented facts on the high cost of obsolescence of motors, plumbing, heating, and ventilating equipment.

Heating and Ventilating Systems: Operation

Nelson (60) discussed heating and ventilating of the past fifty years. Vernon (90) gave an account of fifty years of temperature control in

school buildings. Davy (15) said that thermostatic control makes for an even distribution of steam throughout the building and a resultant saving in fuel. He discussed the relative merits of zone control versus room control.

Larson (46) stated that the fuel bill is affected by (a) construction of the building, (b) type of ventilating system, (c) temperature preferred, and (d) amount of air recirculated. He suggested, for economy, the stopping of ventilation as soon as classes are over. Lewis (48, 49) mentioned two methods of heating: (a) warm air and (b) transmitter. He found no great difference between the two systems as far as cost is concerned. He also discussed operation costs and provisions for maintenance of heating equipment. Kluever (43) reported a saving after changing from warm air to steam, and mentioned other advantages of steam over warm air. Daniels (13) gave suggestions for firing with anthracite and mentioned several advantages of anthracite over soft coal. Frostic (24) stated that cheap fuel is uneconomical. Pesterfield (64) stated that methods of firing are determined by the type of coal used. He mentioned the efficiency and economy of automatic stokers. The Pittsburgh Survey (83) advocated the purchase of stokers where local study indicated this to be an economical move; they advised the purchase of coal on a B. T. U. heat basis with premiums and penalties for deviations. Viles (91) discussed heating and ventilating systems, fuel and combustion, and methods of firing the furnace. Gillis (27) presented the arguments for oil burners in preference to coal but maintained that local conditions should determine the choice.

Scherer (74) suggested the location of the boiler plant away from the building as a safety measure and listed advantages of proper placement of equipment. Thode (88) advised the location of the boiler in an inconspicuous place, preferably in an area where the noise of coal deliveries would not disturb regular work. He also advocated provisions for expansion. Engineer (19) discussed the qualities of water best for the boiler, stating that "pure" water is advisable if available. Stevens (81) gave a plan for a thorough cleaning of the boiler room.

Schmidt (75, 76) and Hill (35) discussed the problems associated with ventilation and deplored the lack of adequate research in this field. Lewis (48) suggested a plan for low cost summer cooling. Brinkman (5) described the solution of a dust storm problem of ventilation by the use of unit ventilators.

Painting

Clettenberg (11) stressed the importance of planning the painting program to prevent premature capital replacements. Kirk (42) and Sward (87) presented technical information concerning the choice of paints. Crawford (12) and Hayden (31), as well as Clettenberg (11), recognized the importance of color in the educative process. Moehlman (56) said that brightening up pays educational dividends. The importance of refinishing walls and ceilings and the choice of colors for light reflecting qualities

were mentioned by Dempsey (17). The St. Louis Survey (84) recommended the use of light shades of paint for ceilings to improve lighting conditions and the use of a greater variety of colors for interior decorations.

Floor Care

Ethington (21, 22) advised the purchase of floor brushes of good workmanship. He said that the floor brush showed the difference between a custodian and a janitor. He gave suggestions for the purchase, use, and care of floor brushes, submitting photographs showing different uses of brushes in four successive stages of wear. Fulkerson (25) gave specifications for the construction of a dusting box for shaking a dry mop. He suggested a covered box mounted on castors. McConohay (53) advised the development of a formula for every operation in caring for floors. These formulas should be printed in a handbook. Viles (91) discussed daily floor cleaning. Longshore (52) emphasized the importance of reconditioning old floors. Adams (2) discussed the finishing of wood floors. Rubber mats and track walkers were suggested by McConohay (53) to lower cleaning costs during inclement weather. Special caution on the care of linoleum was given by Jarden (39). He stated that more linoleum floors are washed away than worn away.

Cleaning

Several articles appeared outlining the duties of the custodian relative to cleaning operations. Grabarkiewicz (29) gave in detail the specific tasks in a summer work schedule. Suggestions were also given in editorials (77, 95). Rita (68) made suggestions for housekeeping. An editorial (78) on school plant management during the vacation period listed certain steps for summer cleaning. Viles (91) discussed housekeeping, cleaning duties, and general care of the school plant. Grabarkiewicz (28) gave a complete description of the steps in cleaning painted surfaces. He reported the use of wax on walls for lengthening the life of paint. He recommended the use of folding scaffolds for washing walls and ceilings. Walker (93) advised experimentation to determine the amount of cleaner needed in scrubbing walls.

Several suggestions were given by Davenport (14) for economizing in cleaning costs. He advocated the use of vacuum cleaners for efficiency and economy in cleaning; changes in working hours for better utilization of personnel; and the use of demonstrations and tests for improving the quality of work. Other changes which he reported as contributing to savings are as follows: (a) reduce "valet" service, (b) individual training of men, (c) replacement of older men with younger men, (d) reconditioning of floors, (e) use of portable vacuum cleaners in some buildings, and (f) introduction of a central delivery system. Brackett (4) mentioned several additional advantages of vacuum cleaning systems in schools, such as

the cleaning of chalkboards, library books, and boiler tubes. He gave suggestions for determining the capacity of the vacuum system needed for a given building. Grill (30) emphasized the importance of the teacher in maintaining sanitary conditions in the schoolroom.

Sanitation

Scherer (73) stressed the importance of cleanliness and the responsibility of the board of education of efficient and sanitary plumbing. He also discussed artificial and natural light and their effect on sanitation. Rogers (71) discussed sanitary fixtures including showers, drinking fountains, and pools. Thompson (89) stressed the importance of clean toilets and gave a seven point toilet cleaning routine. Roberts (69) also discussed sanitation problems. Radder (66) advocated a thorough study of plumbing of each school building by master plumbers.

Miscellaneous

Holy (38) stated that research in the following areas would lead to economy in maintenance and operation: (a) building construction; (b) heating, ventilation, and sanitation; (c) equipment for schools; (d) artificial lighting; and (e) management of school plant personnel. Susanka (86) discussed the difficulty of classifying expenditures as maintenance and operation and gave examples of variations in practices. Robertson (39) presented the advantages of a flat roof with suggestions for practical methods of repairs.

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PART IV

CHAPTER XII

Relations of States to Local School Units¹

T. J. TORMEY

Financial Controls by the State

A DETAILED INQUIRY INTO THE REORGANIZATION of the governmental machinery for administering state financial affairs as it affects state higher education in each of the forty-eight states was reported by McNeely (16). He reported that, first, control over the appropriations before being made to the institutions by the state legislature is lodged in the governor, a budget board, or a commission through the establishment of state executive budgetary systems of one type or another in forty-seven of the forty-eight states. Second, control over the appropriations, after being made to institutions by the state legislature, has been conferred on the governor or state central executive agency through direct supervision or administration of their disbursements. There are a number of devices for effecting this type of fiscal control. Among them are (a) appropriation on a conditional basis with power vested in governor or agency to reduce the budget to avert deficit, (b) each institution being required to submit to the governor or agency prior to the beginning of each quarter of the fiscal year an itemized requisition or work program showing the amount of appropriations needed to carry on the work during the period. In this instance, the governor or agency is authorized either to approve or alter the amounts of the quarterly requisitions or work programs, together with individual items included in them. Third, the governor or agency is empowered to give prior approval or disapproval of all contracts, orders, or documents of the institution involving disbursements or incurring financial obligations against their appropriations. Fourth, approval or disapproval is likewise lodged in the governor or agency with respect to invoices, bills, or claims before payment out of the appropriations of the institution. Fifth, a continuous check is maintained of the disbursements of appropriations through periodical financial statements or reports. Sixth, the governor or agency is empowered to investigate the administration, operations, or activities of institutions with a view to reducing expenditures.

Haydis (12) studied state aid and control of public-school building projects with particular reference to four states. He stated, "There is no definite building fund policy for any major geographical section of the United States, and there is little similarity in purpose, bases for eligibility, and/or method of apportionment among the states having building funds."

¹ Bibliography for this chapter begins on page 239

He set up four principles which should form the foundation of the state's control and of school building projects. Briefly stated they include (a) building aid as a part of an equalization program; (b) broad powers delegating control in a centralized executive staff; (c) state control exercised through a division of schoolhouse planning in a state department of education; (d) such division should be established with its broad powers indicated by law.

Control of school accounting exercised by state requirements and recommendations was studied by Martin (18). He found an enormous lag between theory and practice in school accounting. He found, further, that almost complete agreement existed as to the underlying principles of school accounting as evidenced by the response of public-school business officials, state department officials, and professors of school administration to the twenty basic principles enumerated.

Building Codes for States

School plant standards for rural and elementary schools were studied by Kennerly (14) to determine the varying degrees of emphasis placed upon various phases of the school plant by different regions of the United States. Nineteen states offered "nothing in the way of a definite building plan and no effort is being made by these 19 states to set up a definite or detailed list of materials to be used in the construction of rural school buildings." Stewart (21) studied state school codes "to show what various states have to offer in the way of schoolhouse building codes or laws." School laws of thirty-five states make provision for the approval of building plans and specifications of the school building; seven states provide that after the final approval of plans and specifications there may be no changes or alterations unless the desired changes are shown on the new drawings.

Bostick (1) studied conformity of practice, as revealed by blueprints, with the school building law in Texas. He found that 75 percent of the one-story group conformed while but 57 percent of those having more than one story conformed. Dickinson (9) and Turner (25) proposed school building codes for Arizona. Herber (13) reported a study of the Public Works Administration as applied to school buildings in New York State. Dersham (8) gave a detailed report of steps taken in the construction of a school building under PWA loan and grant. As part of a series of publications, Stoneman and Broady (22) presented supplementary standards for the small twelve-grade building. The "small school" refers to schools enrolling 200 or fewer in the elementary grades and 150 or fewer in the secondary school.

Reorganization of Local School Districts

Reorganization studies in Ohio were made by McCowen (15), Freshcorn (11), Teets (23), and Porter (20). Martin (19) studied the school organization in a county in Michigan using the criterion of natural centers where

larger units for educational purposes might be established more nearly to equalize opportunity. This study is but one in a series of Michigan studies which later will be summarized in a master study for the state. Joint high schools for the small towns of Connecticut were investigated by Maddocks (17). He recommended that (a) the minimum enrolment for a joint high school be 250; (b) the state board of education should designate the joint districts and locate the joint schools after careful survey; (c) each such high school should include at least four of the upper six years of schoolwork.

The state of Washington (28) has given consideration to the reorganization of school districts, strengthening the county and state educational administrative machinery, and an expansion of school services. A monograph by Breckner (26) described the plan under which the current operating revenues are raised and distributed. Breckner (2) later reported on the history, activities, accomplishments, and problems of the school district reorganization. The proposed reorganization of Kitsap County was next reported by Breckner (3), followed later by reports (4, 5) on several other districts, and a progress report (27). Thurster (24) reported that eighteen states have completed or initiated statewide surveys of school building needs. Covert (6) reported that approximately 55 percent of the funds used by the public schools of West Virginia came from statewide sources in 1937-38. Covert (7) also reported on the projected school building program for Pennsylvania.

Zook (29) stated that the published report on public institutions of higher education in Utah was influential in the shaping of some legislative proposals for reorganization of the state higher educational facilities in educational institutions. Zook also said that the Committee on Government and Educational Finance had developed plans for the publication of profile charts to indicate the level of public-school financial support and that plans are being made to secure similar data for the institutions of higher education.

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CHAPTER XIII

Court Decisions in the School Plant Field¹

S. M. BROWNELL and M. M. SCHWARZ

STUDIES BASED ON COURT DECISIONS in reference to the planning and construction of buildings were reviewed in Chapter V. Other legal research in the school plant field has been concerned with (a) tort liability and negligence, (b) use of property and school funds for purchase of property, (c) tax exemption and other aids to private schools, (d) title of property, (e) effect of alteration of school districts, (f) insurance, (g) abandonment and reversion of real property to the grantor, and (h) college and university property.

Chambers (8) has reviewed some eighty-eight studies of legislation and court decisions in the school finance and business administration field, which included the bulk of the legal problems arising in and about the school plant. An annual review of court decisions, classified and arranged under convenient headings, may be found in the *Yearbooks of School Law*, which he edits. Less complete reviews of current decisions are published, from time to time, in the section on school law in the *American School Board Journal*. While many studies have been produced in the past three years which have brought up to date the report of the decisions on one question or another, the most comprehensive research in the general field is still Punke's work (43) published in 1936. Although the law could never be called static, most of the principles and trends determined by him have been reaffirmed.

Tort Liability and Negligence

Rosenfield's book, *Liability for School Accidents* (48), is based upon more than 450 references to court cases, opinions of attorney generals, and legislative acts. It is a thorough study of negligence in law as applied to school cases. In dealing with the specialized cases of school accidents, it includes accidents that are due to building, grounds, and equipment condition or usage. It emphasizes the questions involved and the findings rather than analyzing a large number of cases individually. Hamilton (25) and Hodgdon (28), in their case and problem books on school law, consider tort liability and negligence including cases from the school plant field. Studies by Fuller (21), Foley (19), and by Fuller and Casner (22) analyzed and evaluated the theory and practical results of tort liability and negligence as applied to public-school districts, officers, and employees in the United States. Using the historical approach largely in his study, Fuller (21) concluded that immunity of school districts from ordinary liability for the tortious acts of its officers, agents, and employees is un-

¹ Bibliography for this chapter begins on page 250

justified. He presented legal theories and compared the experience of states which maintain the immunity with that of those where school districts are liable for torts. He noted that in nearly all states tort liability has been enforced for a few classes of torts such as those involving trespass, nuisances that damage real property, and assumption of liability for negligently operated school buses.² He concluded that statutes making school districts liable could well be framed along the line of those operating in California since 1932. Possible amendments would define upper limits of recovery in cases of disaster, and would extend liability to torts other than negligence. He argued that since the primary purpose of tort liability is to provide strong incentives for the prevention of negligent accidents and other tortious harms, and that a secondary purpose is to compensate victims of tortious acts when they are themselves free of legal fault it is unwise to eliminate the personal responsibility of school employees by insurance or statute. Self-insurance by large school districts and a state insurance fund for small districts would seem wise to him.

Foley (19), who likewise analyzed the court decisions and legal theories involved, pointed out the nonliability of school districts generally, but noted exceptions, chiefly in New York, California, and Washington, where statutes permit suits against the school district. He, too, concluded that the present situation is unjust and that the remedy lies through legislation rather than through the courts. Unlike Fuller, however, he would broaden workmen's compensation as a possible remedy of the situation. Fuller and Casner (22) examined the principle of municipal immunity, subjected several legal theories to criticism, and recommended (a) the acceptance by courts of the rule of complete liability of municipalities for tort, and (b) that damages be confined to the monetary damages actually sustained. Higgins (27: 164-66) examined and analyzed all the reports of the decisions of the New York Court of Appeals and the Appellate Division of the Supreme Court from 1848 to 1936. From these he derived forty-five principles controlling the common school. Three of these summarized rules of liability of school districts, officers, and employees for torts and negligence as generally found in New York State.

The use of insurance by public schools as a protection against damage awards is pointed out by Harmon (26: 14). Blackwell (2: 99-105) showed the conflicting decisions of courts in cases involving colleges and universities and pointed out that insurance companies will include a clause in contracts to the effect that they will not avail themselves of the defense that the insured is an educational institution without the written consent of the insured. Chambers' review (14) of court cases of the previous year (1937-38) involving colleges and universities includes some which hold the institutions liable and some holding them immune.

Reports of cases involving tort liability and negligence in connection with the school plant are provided in the *American School Board Journal*

² Liability in connection with buses or other than the school plant is not considered in this review.

(1), the *Yearbooks of School Law* (12: 155-57; 37: 103-109; 38: 92-96; 39: 79-86; 44: 94-95; 54: 83-84), and *Clearing House* (30). Hodgdon, during 1938-1939, presented nine articles on tort liability in *Clearing House*. They were based upon principles of law, problems in the field, and court decisions. His point of view of the inequity of the present rule of nonliability of school districts is in general agreement with that of Fuller and Foley. In the December 1940 issue (30), he stated in one paragraph answers to these questions: (a) May boards of education insure teachers against liability? (b) May the legislature pass a statute to give the board power to insure teachers? (c) May boards of education be made liable for the negligence of teachers? (d) May the legislature relieve teachers from liability of negligence? The general answer, with qualifications, seemed to be "no" in each case.

Use of Property and School Funds for Property

Kindred (36) and Pizor (42) studied statutes, court decisions, and constitutional provisions relating to the use of public funds for private and parochial schools. Pizor organized his findings on a state by state basis, since the constitutions and laws vary from state to state. The conclusions reached by both studies are in general agreement that the courts are divided on whether public-school property may be used for other than school purposes without express statutory permission, and that recent decisions show a tendency to recognize the schools as centers of community life. These conclusions are consistent with the decisions reviewed in other studies; for example, a school cannot loan library or laboratory equipment permanently to a private junior college (32: 148-49; 55: 71-72); a school can lease its grounds to a ball club provided this does not interfere with the operation of the school (17:76; 46: 64-65); a school may be used for public dances and community recreation (25: 104-10; 42: 100-101); and if the statutes permit community use of a building, a school-board may permit or refuse the use for religious, lodge, or commercial purposes which do not interfere with the operation of the school program (42: 115). Kindred and Pizor also considered the variation in court rulings concerning whether public funds may be used for rental of church school property for school use, concluding that generally this was illegal, unless it could be shown that these were the best or only available premises (36; 42: 163; 57: 96-97). An exception to this general ruling is cited and the entire problem is discussed in a study appearing in the *Yale Law Journal* entitled "Catholic Schools and Public Money" (58).

Reports of court actions concerning the power of the board of education in management and disposal of school property indicated that decisions were closely dependent upon the statutes. They affirmed in the several cases that a schoolboard was empowered to convey properties (1, July 1940: 58; 29: 299-302; 46: 67-68); raze a school (1, July 1940: 58; 46: 66-67); abandon or reopen a school (50: 57; 34: 72-73); lease it to an

oil company (55: 73-74); or conduct school for Negroes in a building formerly used for white children (54: 83).

The courts also decided that proceeds from the sale of a building should be used to retire outstanding bonds of the building and not to make additions and improvements to other buildings (1, June 1940: 60; 41: 87); that money from sale of a high school could not be used by the elementary-school districts which it embraced (55: 74); that money raised for retirement of bonds could only be used for another purpose by vote of the people (41: 90); that the use of surplus from a bond retirement tax was a discretionary power of the board (41: 90-91); and that under certain conditions the board may transfer money from the sinking fund to the operating fund (36: 124).

Statutes requiring an action by the voters before school sites may be purchased or disposed are common. A majority vote is often stipulated by these statutes to authorize the act by school officials. An interpretation of such a statute by an Oklahoma court was reported by Weltzin (54). The statute was so construed by the court that the contemplated act could be authorized by a majority of only the electors voting rather than an approving vote of a majority of all qualified electors in the area. Punke (46) digested an Oregon case in which the court said that a district may have as many schoolhouses and sites as it desired, in answer to an allegation that a majority vote could not grant authority to select a new site and build a new school in a district which already had a school. A taxpayer's suit, to enjoin the construction of a high-school building on a plot larger than the board was authorized by statute to acquire, was tried before an Iowa court (55). The school corporation's title was held valid as to that part of the plot within the size authorized by the statute.

Keesecker (33) cited a Montana case in which the court ruled that it has no power to control the decision of a schoolboard as to whether it will conduct a school or send pupils elsewhere, in a particular way, but the court will compel the board to exercise its discretionary function. Thus a schoolboard, having exercised its discretion to close the school, must then exercise another discretion by determining whether it would provide the children in the district with transportation or board and rent, and, in any circumstance, tuition while attending school in another district. Faced with inadequate facilities, school directors have commonly adopted the practical measure of either renting or partially maintaining quarters in either a private or sectarian school building, and conducting therein a public school. Courts in interpreting the legality of such action have reached conflicting results (32: 146-47). Iowa and Kentucky courts ruled that the arrangement practically turned the public school into a sectarian school and enjoined its continuance. A Wisconsin court permitted the rental of rooms in a parochial school, where a statute conferred power upon the public-school directors to buy or lease a site for school purposes. An Illinois court reached a similar conclusion without such an enabling

statute. Chambers (13: 61), in summarizing cases in this category, observed that although the decisions are somewhat in conflict high judicial pronouncements are making important contributions to continuous working out of a solution whereby educational opportunity and religious liberty can be preserved under varying situations. The most thorough studies of public-parochial relationships have been produced by Kindred (34, 35, 36).

Title to school property is generally vested in the state and said property is held in trust for the state by the local school district. An Oklahoma statute (54: 83) provided that cities holding title to property purchased for school purposes should transfer it to the local boards of education, when requested by the latter. Under this act, Oklahoma City was ordered to comply with a request of the board of education to turn over to it the title to property obtained by the city through a federal grant. Chambers (15) reviewed the New York exception to the general rule, where if the board requires property for legitimate use, title must be taken in the name of the city, unless boundaries of the city and the school district are not coterminous.

The question of relief for a vendor, when an illegal procedure had been followed, so that notes and a mortgage issued in payment for school property were declared void, was decided by a Florida court (54: 82). This court ruled that if the district, whose improper procedures resulted in the impasse, does not wish to lose its property, it must pay the sellers what is equitably due them. Punke (46) summarized an Oregon case in which the right of school officials to sell and convey property hinged upon the subsequent use to be made of the property. Districts could transfer property only when the property continued to be used for public purposes. Failure of a county to make use of property more than seven years subsequent to the execution of the deed by the school district entitled the district to reconveyance of the land. A Montana county treasurer (55) was ordered to deposit funds derived from the sale of a high-school building to the credit of the high school, rather than distributing the funds among the various schools of the county as originally planned.

Although personnel problems cannot be touched here, a contribution by Chambers (11) is worthy of mention. This covered, in some detail, the legal problems and the employment status of school janitors, a question of importance in the maintenance of the school plant.

Courts are granting more freedom to the schoolboard in determining the use to which the school plant may be put; and in discretionary matters they will not disturb the board's determinations, in the absence of abuse. The authority of a schoolboard to rent athletic fields to a local ball club was upheld by an Idaho court (46: 64-65). This court, in rejecting the complaint, said that it is an almost universal rule that leasing of school buildings and parks for private purposes, which are not inconsistent with the conduct of the school, is not an unconstitutional use of such property. An Illinois high-school board, however, was enjoined from fulfilling an agreement with a private junior college, which provided that certain of

the high-school facilities were to be used jointly by the students of the public high school and a private junior college by means of a kind of loan (16, 32, 55: 71). After weighing the leading cases dealing with collateral use of school property, Pizor (42) found that the main criterion applied by the courts is clear and concise evidence that a public purpose is being served and that such use is in accordance with the fundamental principles of American government. Another pertinent point in the use of the school plant was emphasized by Chambers (6, 9) and Keesecker (33). Their studies of decisions showed the limitations on educational opportunity open to rural youth, for in many instances the small and remote high school is the only school open to free attendance by pupils who live nearer to larger and better ones.

Tax Exemption and Other Aids to Private and Sectarian Schools

A study by Kearney (32) reviewed court decisions and considered three forms of aid to private and sectarian schools: (a) nonfinancial aid, such as prohibiting objectionable businesses near a school, traffic regulation, compulsory attendance, and credit regulations; (b) financial aid, such as tax exemption, payment of student tuition, rental or maintenance of a building, loan of library or other equipment, and free water; and (c) indirect aid through aid to students, transportation, and textbooks. Pizor (42: 67) also made brief mention of tax exemption as a form of state aid to private and parochial education. As particularly applied to the school plant, the recent court decisions upheld tax exemption of a private college and a business college (12: 152-53; 14: 91-92; 52: 134-35); declared municipal housing projects to be public property and tax exempt (45: 80-81); but refused to exempt fraternity houses from taxation (12: 153; 14: 93; 52: 134); or to exempt personal property in a house rented by a school from a private owner (52: 134). It was also decided that charter exemption from taxes could be voided by legislation without violating Article X of the United States Constitution (which forbids a law impairing the obligation of a contract) holding that taxing power cannot be irrevocably exempted; otherwise it would destroy a power which there is no legislative power to destroy (52: 132-34). A bequest to an educational institution was not exempt from state inheritance tax (52: 135; 55: 73).

Title of Property

Although no special studies were conducted concerning the problem, several cases came before the bar questioning the title to school property. In these cases, the courts decided that property which contains the specific condition in its title that the property is granted only so long as it shall be used for educational or school purposes reverts to the owner or his heirs upon discontinuance of that usage, but not otherwise (46: 68-69; 54: 82-83; 55: 71); that "educational purposes" in the instance at bar meant school use and not general educational purposes (46: 70); that

if a total site is larger than permitted by statute, title remains valid to the school district for that part of the land within statutory size (55: 70); that negligence by the party granting a title does not invalidate a title to a school district (55: 70); and that a school district received title by adverse possession to property granted by a life tenant (46: 63).

Effect of Alteration of District Boundaries on the School Plant

How consolidation of districts changes the relation of a school district to school property was brought before the courts in several cases during the past three years. It was decided in two cases that the whole of the new district was responsible for the bonded debt of the two original districts (23: April 1939, 53; 25: 18-19); while in another instance it was held that consolidation did not relieve the original district for its bonded debt (20: 114). In a suit to determine whether property might revert to a conditional grantor the court decided that the formation of a union district did not constitute abandonment of a site by the school district (46: 71).

Insurance

Gruelle (24: 19-50) reviewed the legal status of insurance on public-school property, with special reference to Kentucky; compared insurance laws of states having some form of self-insurance; and made a special study of the Kentucky school insurance problem. By citing court decisions, he concluded that boards of education in most states may insure property, even without explicit statutory authorization (24: 21-32). The court's judgment concerning an unusual insurance problem was presented in the opinion and dissenting opinion of an Oklahoma case. It was held that a company must pay an insurance loss although the premium was on a credit basis which violated the constitutional prohibition against indebtedness beyond current revenues and although there were no written minutes of the meeting at which the insurance was contracted (1: Nov. 1939, 62; 55: 74).

The weight of judicial authority seems to permit insurance as a part of the general power of school officers to manage and care for school property (24, 43: 232). The amount for which buildings shall be insured, or the casualties against which insurance is taken, are matters within the discretion of school officials, unless a statute specifically provides otherwise (43: 238). A recent adjudication by an Oklahoma court (55: 74) concerned insurance premiums on credit. A school district, being without funds with which to pay premiums for fire insurance, obtained policies on a credit basis. When the property burned, the insurance company sought to avoid its liability by alleging that the contracts violated the Oklahoma constitution prohibiting indebtedness in excess of income and revenue for the fiscal year. The court held the contracts valid, reasoning that the obligation rested on the company to discover the limitations of authority of the schoolboard, and that if the company could not recover against the

board, it might do so against its individual members. A strong dissent, which is probably the better law, condemns the majority opinion as enforcing violation of the constitution through upholding a clearly illegal contract. The Illinois appellate court ruled that the schoolboard could not be held liable, even for the reasonable value of insurance, when the contract agreement was made informally, and none of the minutes showed the vote on the transaction as required by statute (50: 59). One of the conclusions of Gruelle's study of insurance (24) was that a board of education in Kentucky may not become a director in a mutual company, but there was no reason why it would not be eligible as a member.

The question most frequently raised concerns the right of the schoolboard to purchase insurance to protect it from liability, to which under the common law it is not subject. Remmlein (47) and Rosenfield (48: 133) concluded that there is a growing number of states which permit liability insurance to cover damages resulting from negligent operation of school buses. Washington, New York, and California permit liability insurance to cover district liability for accidents because of the removal of common law immunity in certain tort actions. Joyner (31: 48) found that in Alabama and Georgia insurance companies were not held liable, even though negligence was proved and the district carried automobile liability insurance. Courts in Tennessee and Texas, however, held that if the district carried liability insurance on its vehicles the insurance company or the district could not raise the defense of immunity in performing a governmental function. It may be that legislatures are slow to enact mandatory insurance legislation for schoolboards since that would appear to acknowledge the district's liability, which to date has, with few exceptions, been denied (47: 100). Dice (18) recommended that districts be compelled to assume liability for the negligence of their agents and to carry insurance covering that liability. A factual analysis was made by Fuller (21) on the operation of tort law, workmen's compensation, and insurance in widely scattered American cities where school districts are liable in tort. He decided that self-insurance is preferable to commercial public liability insurance for large districts and is far less expensive. Provisions for smaller districts should be made through established state funds.

Reversion to the Grantor

Deeds, which provide for the use of real property for school sites only, are a fertile field for litigation. Courts in the public interest make every effort to prevent reversion, but where the reversionary clause is unmistakable they are forced to follow the terms of the agreement. The language of a deed which stated that ". . . said lands to be occupied for the purpose of a schoolhouse and for no other purpose whatever," and, "to have and to hold the same to the only proper use of said board of education . . . so long as the same shall be occupied as a site for a school," was held by an Ohio court to provide for a reverter and forfeiture. When the

district attempted to sell, it reverted to the heirs of the original grantor (54: 82). An Iowa court permitted a college to sell property when the instrument of conveyance used these words: ". . . said land to be used for educational purposes and religious purposes only" (54: 83). A New York dispute (46: 68) also related to whether a deed adequately provided for reversion. The deed recited that the grantors "bargained and sold" said land "for the site of a schoolhouse and for the length of time only which it shall be occupied for that purpose." The court held that "the school district would lose the right of possession if the maintenance of a school on the site was permanently discontinued." Further decisions on reversionary interests were summarized by Punke (46) and Weltzin (54, 55).

A North Carolina district (55: 71) had not abandoned a school so as to vest the heirs of the grantor with title to the property, when it offered said property for sale, took bids, then rescinded the plan to sell and again used the property for school purposes.

College and University Plants

Court decisions relating to colleges and universities have been reviewed by Chambers (7, 10, 14) annually for the past three years. Brody (3, 4, 5) contributed digests of cases concerning tax supported institutions of higher learning; Weaver (51, 52, 53) and Chambers (13) digested cases arising in colleges under private control. A decision by the United States Supreme Court that a state institution must collect and pay the federal tax on admissions to football games has important implications in the use of the plant. The reasoning of the court, as reported by Brody (3: 145), holds that the conduct of exhibition games is not a function of the state government but remains an essentially commercial enterprise, and the private character of such enterprise is unaffected by the fact that the state may use such means to support a governmental function such as higher education.

Chambers' summaries of trends (7, 10, 14) are supported by other contributors to this topic. The trends discerned by Chamber (14: 95) in 1939 were:

1. Closer scrutiny of tax exemptions with occasional restrictions thereof, especially in the field of tax exemptions and in taxation of accessory educational corporations such as fraternities and the like;
2. Modification of the doctrine of complete immunity from liability for torts, when the innocent injured party would be left without a remedy;
3. Attention to demands of Negroes in southern and border states for equal opportunity for graduate and higher education;
4. Tolerant and receptive attitude toward new plans for financing buildings in cooperation with other agencies, whether federal government, local public school districts or private non-profit lending corporations; and
5. Continued favor toward educational trusts.

The 1940 summary by Chambers (7: 87) showed that no trends in the 1939 report were reversed and some were accentuated. Three more decisions

sustaining self-liquidating plans for financing buildings at state institutions were reviewed. Two cases in which colleges have been held liable in torts, one in a state and one in a privately controlled institution, would seem to indicate that the old doctrine of immunity from tort liability was being softened (7: 76; 51). In his latest report, Chambers (10: 108) noted an absence of litigation concerning financing and construction of buildings and tort liability in colleges.

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FOREWORD

THIS ISSUE OF THE REVIEW represents one of the new areas planned by the Editorial Board in February 1938 and February 1939 when the list of topics for the fourth cycle was reorganized. The issue was designed to cover aspects of education, particularly of instruction, which are general, as contrasted to particular levels, subject fields, or specialized interests. In this sense it has no predecessor, though two of the areas which formerly comprised the issue on "Psychology of Learning, General Methods of Teaching, and Supervision" (June 1939, June 1936, and October 1933) are included. The third area of those earlier issues, namely, "Supervision," has now been transferred to the issue on "Teacher Personnel" (June 1940).

A number of new topics have been included in the present issue. Topics which are presented for the first time as chapters are "Philosophy of Education," "Radio and Other Auditory Aids," "Visual Aids," and the "Library." These topics have had scattered and somewhat fragmentary attention in earlier issues, and such treatments will be found by consulting the indexes in the REVIEW.

In accordance with plan, the treatment herein accorded the curriculum and curriculum-making is restricted to general aspects. Work on the curriculum in individual subject fields is presumed to be treated in the several issues of the REVIEW which are devoted to these subject fields.

Other issues of the REVIEW which may be regarded as supplementary to the present issue in treating rather general aspects of education are "Organization and Administration of Education" (October 1940) and "Methods of Research and Appraisal in Education" (December 1939 and December 1942).

DOUGLAS E. SCATES
Chairman of the Editorial Board

CHAPTER I

The Curriculum: A General View

WILLIAM L. CONNOR and RAYMOND WHITE

Historical Perspective on the Curriculum

THIS CHAPTER is devoted to a brief summary of some of the chief phases of research and creative thinking in the general field of curriculum-planning and construction. The more important published studies since 1936 are reported in some detail. Less important studies are summed up in a sentence and others appear in the bibliography without comment. It may be well to review sketchily the curriculum-revision movement—how we came by the curriculum we have, why we are trying to change it, and how we are going about it.

Nearly 2,500 years ago there lived and worked in the city of Athens two overlapping yet opposing groups of philosophers. Chief among them were Socrates and Plato, on the one hand, and Aristotle on the other. Whatever else we may say of the work of the first two men, this, we think, would be generally accepted: Socrates and Plato struggled with the idea of making a choice of what was to be taught to young people in order that they might enjoy the good life and develop the ideal State. On the other hand, Aristotle set up a research organization—the first great educational research organization in the world's history and perhaps the largest that has ever existed in the world—to discover everything to be known about literally everything, to organize it, and finally to write it into textbooks, so that others might, by studying these texts, acquire universal knowledge. For a number of reasons, some too lengthy and others too obscure to report here, the Aristotelian philosophy prevailed; and from his time to our own, education has largely been a process of discovering facts and truth, or what passes for facts and truth, and the organization of this material into textbooks for study in the schools. As scientific and historical research, philosophical thinking, and creative writing have increased in the world, the bulk of the world's knowledge has grown until the textbook has tended to become a compendium of knowledge in its given field, briefly and abstractly stated, and impossible of comprehension except by scholars highly trained in each field.

About the turn of the century there was a revival of the study of Socrates and Plato and the beginning of new philosophies based, in part, upon them and their thinking and, in part, upon the facts of the social situation as they present themselves in the modern world. Perhaps the most prominent philosophy that arose out of this ferment was the philosophy of pragmatism: *That which works is true*; and, in psychology, atomistic behaviorism: *Human learning is simply the conditioning and progressive reconditioning*

of one reflex after another, in detail, until a behavior pattern is formed for the adult The revival of the ancient philosophy of Socrates and Plato and the development of pragmatism and behaviorism resulted in a few new textbooks and courses of study presenting elements of choice in terms of personal and social usefulness and detailed analyses of subjectmatter arranged for step-by-step learning of those details which were supposed to be true because they were observed to be useful.

A little more than a decade ago, four new elements were injected into the picture: (a) Philosophers who believed in absolute truth reasserted themselves as realists and began to compete with the pragmatists for control of curriculum-planning. (b) Psychologists began to discover that the physiological basis of behaviorism was untenable—that *the central nervous system acts dynamically as a whole*—and they proceeded to demonstrate experimentally a dynamic theory of learning, characterized by the presentation of interesting or “dynamic” material stimulating immediate, almost automatic, organization of ideas into thought and action, and leading to emotional drives sufficient to bring about the mastery of less interesting or actually inert material. (c) City and state school systems, as well as experimental schools, began to set up organizations to revise the curriculum or to plan wholly new curriculums. (d) Textbook writers began to write new textbooks to carry out the proposals set up in such new curriculums. Needless to say, city and state organizations have been variously led and have adopted strange combinations of all known philosophies and psychologies to guide their work.

Current Criteria for Selection of Subjectmatter

Out of this welter there are beginning to emerge a few principles, partly philosophical and partly psychological, on the basis of which curriculum materials can be chosen: (a) *Social*. Those facts and principles should be chosen for teaching which are most likely to enable the learner to master his environment, or to adjust to it, in the interests of the good life for him and for society. Some persons forget subjectmatter in their enthusiasm for the belief that social goals are to be achieved almost wholly through democratic living in the school. (b) *Psychology of Learning*. Of any two or more facts equally useful, that one should be chosen for the approach to learning which is inherently most interesting or, when properly presented, most “dynamic,” that is, most likely to lead to a prompt, almost automatic, organization of ideas into thought and action and an emotional drive to attack less dynamic or even inert related materials. (c) *Testing*. Standards of performance and tests for measuring them are being revised in terms of what pupils of known intelligence can achieve when given better curriculum materials and better teaching. Evaluation of growth along desirable lines by systematic observation is supplementing testing—in some cases, replacing it. Attempts have been made to test “whole growth” resulting from “whole activities”—knowledge,

skills, intangibles, and so forth. The new "eight-year" or Aikin experiment tests are examples. (d) *Functional Activities*. Functional activities are treated not as disciplines but as life problems here and now and are useful in training for today and tomorrow. Community resources are much utilized. The ability to think is judged to be the best preparation for life. Facts and skills take relative places in the picture, with ability to think being primary.

One may, however, examine the whole body of published literature on the curriculum and on curriculum-planning without discovering much positive evidence of the clear emergence of these ideas. In fact, the reverse philosophy and practice, or contradictory philosophies and practices, still hold in most quarters. This means that little objective research has been done—primarily, because there is no dominant guiding philosophy. This chapter on the review of research and creative thinking is presented, therefore, as a brief description of a rather confused transitional period from which it is hoped that clearer philosophies and better practices may, in the next decade, emerge.

Recent Philosophical and Analytical Treatises

Dewey (39) clarified his philosophy by explaining the meaning of experience, freedom, activities, discipline, control, and the place of subject-matter in a positive philosophy of education. Contrast and comparison of progressive and traditional practices serve to bring out vividly his philosophy of experience—continuous and interactive—as both the means and end of education. The book is no defense of progressive education but, as a restatement of a fundamental point of view, it may serve to save those who are attempting to work out a forward looking program from some of the pitfalls of the ultraprogressives.

Bode (14) pointed out the inadequacy of the concept of democracy as being that political organization which permits an individual the greatest freedom. Democracy, according to Bode, is a way of living by the group for the good of the group. The section which states the implications of education for democracy as a way of life also presents a point of view for the curriculum worker.

The school must undertake to exemplify in its organization and procedures, its conception of democratic living.

The primary obligation of a democratic community to its members is to provide for each the opportunity to share in the common life according to interest and capacity. (14:77)

The materials taken from the surrounding environment and the procedures in the school

... are designed with reference both to the discovery and exploitation of individual capacity and to a continuous deepening sense of membership in the social order. (14:83)

It [the school] must not merely practice democracy but must develop the doctrine so as to make it serviceable as an intellectual basis for the organization of life. (14:94)

Morrison (91) defined the general curriculum as the curriculum of the common schools and estimated the time required to cover it. To Morrison, the curriculum is the sum total of all the common activities of all the people, and all these activities should, sooner or later, find themselves in the schools, regardless of whether that is possible at the present time. Morrison analyzed the common activities which should be in the school. This analysis is presented in terms of subjects to be taught and is distinctly Aristotelian in its outlook, although modern subjects and new phases of all subjects are presented.

Bobbitt (13) made a fresh attempt to analyze society, and the good life in society, as the basis for the curriculum. He carried forward his own and the presentday rebellion against the mediocrity of education conducted through subjectmatter as determined largely by Aristotle, and, since his day, fixed upon the schools.

Beard (96), in the first pronouncement of the Educational Policies Commission, called for educational leadership to reconsider the obligations of education to our democracy. The Founding Fathers considered education the heart of democracy but were prevented by the exigencies of the time from making it so. During the period of Jacksonian democracy, education developed with the growth of the states into state systems with an emphasis on the development of the individual. It has largely followed this pattern until the present time. Let education, says Beard, assume its unique function of preparing youth to live in a democracy.

Hopkins (63) believes the good life is achieved by living it. The curriculum thus becomes those experiences necessary to live the good life in the school. They are to be selected cooperatively by teacher, parent, child, and all others capable of entering into the picture. The individual assumes responsibility for group activity and willingly takes his part in it. Learning, class and school administration, organization of curriculum experiences, and measuring of outcomes are discussed in the light of this basic philosophy of education.

In *Progressive Education at the Crossroads*, Bode (15) stated: "The progressive school cultivates an atmosphere of activity and freedom all its own . . . is a place where children go, not primarily to learn, but to carry on a way of life." (15: 9) Bode identified progressive education with the rise of the common man. He warned that it must cease to be absorbed with the development of the individual pupil and must be guided by a social ideal—the democratic way of life.

Profitable growth in our day is growth toward a plan for living intelligently in a topsy-turvy world and such growth must have reference to the issue of democracy, which in one form or another, is cropping up everywhere and which is, by all odds, the most important issue confronting us at the present time. (15:85)

He does not wish to depart from teaching the child as a person, but, as he sees it, teaching today lacks social direction and this "participation

in a common life is an essential condition for enrichment of experience." Group planning, socialization, projects, and similar innovations point to this essential ideal of a democratic way of living.

Progressive education has a unique opportunity to become an avowed exponent of a democratic philosophy of life, which is the last remaining hope that the common man will eventually come to his own. (15.122)

The first part of the book by Hopkins and the Committee on Integration of the Society for Curriculum Study (62) gives the evidence for integration in its biological, philosophical, psychological, and psychiatric aspects, each by a specialist in his respective field. In the light of the principle of the integration of behavior, various types of curriculum organization and practices are evaluated. The traditional subject type of curriculum has least integration; then follow in order the correlated, broad-fields, core, and experience curriculums. While the experience curriculum offers greatest opportunity for integration of experience, and there is a trend in this direction, the author seems disturbed about guidance, because it is, in his opinion, synonymous with education; also he appears to have questions about the practical aspects of administering the experience program.

Lee and Lee (81) wrote to help the elementary teacher develop a curriculum better suited to his children. Proper guidance of child learning requires an understanding of the child as a purposing, growing individual with a personality all his own. The first section of the book discusses the child. The second part of the book gives suggestions for curriculum change in the various areas of experience—social, number, scientific, health, and creative. These suggestions serve as guides to the teacher and at all times give the impression that he is the "director of curriculum" in his own classroom.

Mossman (92) presented a brief account of the history of the "activities" point of view in curriculum development, together with an interpretation of it. She showed that this point of view has been steadily gaining in educational thought and practice since the time of the Renaissance, continuing up to the present day. It is not a fad but a steady growth which has probably not yet reached its peak of maturity.

Rugg and others (113) reported that their survey of the social, economic, and political background of presentday America shows great changes in American democracy. The authors drew up a balance sheet of assets and liabilities to indicate the promise of democracy in America. Democracy and education are interwoven—each dependent on the other. The position of youth in a "depressed" society is not favorable to desired growth. The school has lagged in making adjustments to offer satisfactory educational opportunities. The last two sections are particularly important for curriculum reorganization. The first of these is a discussion of the growth process and the relationship of the growth of the individual to the culture of the race. In the second, the authors discuss "promising efforts" for curriculum reform and indicate directions for progress in the years just ahead.

Rugg (112) described how mass education grew in the Machine Age when frontiers were being rapidly expanded. In the period that followed, education lagged behind progress in other phases of our national life. Thus education, which was designed to perpetuate and give impetus to our national life, was failing in its mission. Rugg does not favor what he calls "administrative tinkering" but a thoroughgoing readjustment of the school's program. In his school, activity holds a prominent place. The illustrations of the new program in health, social studies, and art are indicative.

Schoenchen (120) reported that the activity school is "the result of a slow growth of pedagogical doctrine and practice to which the most diverse types of educational movements have contributed." The author sees the method of the activity school as "heuristic," to which he seems to give the general meaning of helping the child find out for himself as far as possible rather than being told. Pupil activity is formally and systematically applied to teaching procedures. The rather lengthy criticism of Dewey's concept of the activity school seems to be a matter of fine distinctions rather than real differences. The writer relies more on prescription and less on freedom than most progressive educators would favor—"the teacher so manipulates the learning situation that the pupils will choose the activities which the teacher has pre-selected for them to choose."

In *The Changing Curriculum*, Harap and others (97) presented an attempt to get a "glimpse of the distant scene" of curriculum reorganization and to appraise progress on certain programs of curriculum planning in action. The first part of the book is a discussion of the current status of curriculum thinking as regards its basis in the good life and its organization in functional units of experience. The analysis of certain state, county, and city programs of reorganization includes a description of each program with some criticism in the light of the concepts developed in the first chapters of the book. The committee presents a dynamic approach to the problem. There is unity in the basic principles underlying curriculum reorganization, according to these authors, and these principles are well illustrated in the examples of programs in action. At no time is it intimated that we "have arrived," but the challenge to teachers to work on the curriculum is clearly pointed out.

Washburne (136) described the philosophy and practice of education as it is carried out in the Winnetka schools. Throughout the book there is an attempt to justify the Winnetka program. One who has followed the plan in Winnetka for many years can see changes—changes which bring about somewhat more freedom. However, essentially the plan has been, and is, one of prescribed minimum essentials with considerable freedom in some broadening activities. The "essentials" consist of knowledges, skills, or conventions which the child *will* use—not *may* use. The sections of the book which discuss the recognition of the child as a person are valuable for curriculum reorganization. The democratic viewpoint in school administration is well stated and sound. In such a democratic setting curriculum reconstruction could have freedom.

Everett (43) described nine community school programs. Four of these are in urban centers and five are in rural communities. These centers vary in many respects but in each case the community school is the center and an integral part of the community life. The philosophy underlying the program, the organization, activities, and evaluation are given for each program by a person intimately connected with the plan. These programs give many avenues for making the school a community project through combined school-community planning of curriculum, organization, and administration.

Horrall and his co-authors (64) are workers in Lincoln School in San Jose, California. They have made changes in an elementary school to bring about a more vital program. Their experiment is more important because their pupils are not favored either in ability or in social or financial background of parents. They were somewhat below the "garden variety" level. The building was an old one. Teachers were average, except for an interest in doing something about their mediocre program. These facts make the results of experiment more applicable to most schools. Many progressive experiments have been in schools highly favored in teachers, quality of student, materials, and building. The evaluation of the experiment seems sound. Achievement showed more than normal growth as measured by standardized tests. Other evidences, as fondness for the school, creativeness, health habits, secondary-school success, and citizenship abilities, showed excellent progress on the part of the pupils. The book contains complete descriptions of units of work as they were developed in the school.

Spears's book (125) is valuable as a clear presentation of the directions in which curriculum revision seems to be going. After challenging teachers to do something about curriculum development, six types of curriculum plans of organization are clearly described. Overlapping among the types is recognized, but the classification serves as a frame of reference for the discussion of the type programs which follow. The discussion of actual programs in action constitutes the larger part of the book and seeks "to reveal the specific steps certain schools are taking to arrive at the goals promised by the spirit of the movement" (125: 72).

Research on the Curriculum

The studies reported up to this point are philosophical—creative or interpretative thinking—or they are descriptive. Three objective studies are now to be reviewed.

In the *Story of the Eight-Year Study*, Aikin (1) reported the results of the Eight-Year Study under the auspices of the Commission of the Progressive Education Association. The Commission had two purposes in mind in making this study: (a) to establish a relationship between school and college that would permit and encourage reconstruction in the second-

ary school; and (b) to find, through exploration and experimentation, how the high school in the United States can serve more effectively.

The findings of the study show that the graduates of the thirty schools were not handicapped in their college work, that departures from traditional patterns of prescribed subjects did not lessen the student's readiness for college work, and that the students from the schools which made the most change in the curriculum made the best showing in college. The evaluation was scientifically carried out. It involved careful matching of 1,475 pairs of students and following them through the four years of college work. The "cards were not stacked" in favor of the experimental group. The data which describe the graduates of the thirty schools as contrasted with the graduates of traditional school have much meaning for the curriculum worker.

Two implications come from this study: (a) *Traditional patterns of prescribed courses are not essential.* "The customary relations of school and college are unsound in that emphasis is placed upon out-worn symbols—units, grades, rankings, and diplomas. . . . The conclusion must be drawn, therefore, that the assumptions upon which school and college relations have been based in the past must be abandoned" (1:118-19). (b) *Secondary schools can be trusted with greater freedom in matters of curriculum than colleges now permit.* "If some in the colleges feared that the Thirty Schools would use their freedom recklessly, they now know that their fears were without foundation" (1:124).

The counsel given by the thirty schools reflects current thinking on the organization and content of the curriculum. The approach to the whole problem is vital and realistic. To illustrate: "It is only when these paraphernalia (school buildings, classes, textbooks, courses, and credits) of education can be pushed into the background of one's mind that realistic thinking becomes possible. Only then is the teacher able to see the student as a young human being growing up in a very complex and difficult world. And only then can the teacher begin to see clearly and constructively what the school should be and do" (1:130).

In 1935 Wrightstone published a monograph entitled *Appraisal of Newer Practices in Selected Public Schools*. It attempted to appraise outcomes in certain newer and older types of school programs by "more accurate and reliable measurements than have appeared in articles and addresses by earnest proponents of either newer or older practices." Wrightstone's present study (144) supplements the older one by extending the number of objectives studied by more inclusive descriptions of the practices. Origins and development of experimental programs of education, from the latter part of the eighteenth century to the present time, are described. Instruments for appraising the experimental programs are explained. Six communities in metropolitan areas cooperated in the study—communities representing both the newer and traditional practices. Pupils in the communities were equated by the "matched pairs" technic. Teaching groups

were comparable as to such items as salary, experience, training, and pupil load. Data were secured to see how well each type of school is achieving the objectives of elementary education. The results indicate that, if the objectives selected are valid, "the practices in the experimental schools are more conducive to more comprehensive growth than practices in conventional schools" (144: 220). There was a marked growth in the experimental schools in many of the "intangible" abilities, including desirable social relationships, appreciation of worthwhile activities, aptitudes, and critical thinking. In command of common knowledge and skills, the difference favored the experimental schools, though the difference was not statistically significant.

Saylor (117) analyzed the factors associated with participation in modern programs of curriculum development, using as the basis for his study the state of Virginia, where a statewide program of curriculum development, introduction, and use has been in operation progressively since July 1, 1931. His most important conclusion is: "Two factors emerge from all the evidence of the study as being basic to extensive participation by local school systems in a state cooperative curriculum program of the type organized and developed in Virginia—leadership and, relatively speaking, high economic ability to finance schools" (117: 233).

Perhaps the felt need in communities of relatively high economic ability is usually such as to make them reach for higher teaching ability and more dynamic leadership than communities of relatively lower economic ability can envision. A number of studies deserve brief mention because of their bearing on curriculum problems. Rainey and others (106) in *How Fare American Youth?* reported on the problems which youth face today. Bell (10) reported on the economic and social conditions and the attitudes of some thirteen thousand youth in Maryland. Taken together, these two studies are the proper source material for important changes in the curriculum. Dale (36) reviewed various studies of children's questions and pointed out the significance of such questions for the development of curriculum material. Carr (94) reported excellent examples of school practice in education for democracy. Hollingworth (60) presented an enriched curriculum for rapid learners; Connor (31) summed up the story of the education of gifted children, with emphasis on the plan in operation in Allentown, Pennsylvania. Featherstone (44) described the newer type of activities applied to slow learners.

Charters (26) showed how areas of experience are replacing subjects in the reorganization of the curriculum; Caswell (24) emphasized the importance of stressing contemporary problems to be solved cooperatively; and Brooker (16) called attention to the motion picture and the radio as potential educational tools. Oberholtzer (99) evaluated an experiment with an integrated program and showed that the pupils pursuing such a program achieve more than children in the conventional school. Wrightstone (145)

proposed criteria for the evaluation of state programs of curriculum reorganization.

Conclusion

The present reviewers believe that the last decade, and perhaps even more the last four years, has been a rather confused, transitional period from which it is to be hoped that a clearer philosophy and better research may, in the next decade, emerge.

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CHAPTER II

Organization of the Curriculum

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ORGANIZATION OF INSTRUCTIONAL MATERIALS designates the sequence in which educational experiences unfold during the process of learning. Instructional materials have commonly been organized by subjects within which the chronological and logical sequence determined the order of development. For ages subject lines have characterized the organization of instructional matter. The psychological as opposed to the logical approach has changed the sequence somewhat in many instances, but this change has generally occurred within subject boundaries. Deviations from the logical and rigid organization by subjects and within subjects typify the recent attempts to provide a different and supposedly better kind and sequence of educational experiences.¹

Opinions differ widely as to the merits of any particular arrangement of materials. Bagley (3) stated: "The Essentialists have always emphasized the prime significance of race-experiences and especially of organized experience of culture—in common parlance, subject-matter." Kilpatrick (16) believes that, "To base a curriculum on a scheme of set subjects is for most children to feed them on husks; the plan here advocated is devised to bring life to our youth and bring it more abundantly."

Broad Fields of Study and Areas of Living

Dillinger (7) stated, in the recent revision of the Missouri curriculum: "The Missouri program is committed to a philosophy of general education at the secondary level. The planning committee believes that it is desirable to organize the general program around certain life problems. It believes, however, that these problems can be developed most effectively within certain large learning areas, rather than in a program which abandons all subject divisions." He then listed the broad learning areas as (a) language arts, (b) social studies, (c) mathematics, (d) health and physical education, (e) nature sciences, (f) practical arts, and (g) fine arts.

Indiana (23) held to the basic subject fields but revised the organization within fields. Social studies materials, for example, are selected and organized to conform to the areas of experience appropriate for study on a particular level: first year, adaptation of individuals to group, home, and school life; third year, understanding life in the broader community; sixth year, understanding the contributions of the Old World to American ways of living; junior high school, group life and problems in the com-

¹ Various forms of administrative organization to aid in adapting school experiences to pupil needs were discussed in "Organization and Administration of Education," *Review of Educational Research* 10 315 23; October 1940.

munity and state and in the United States; and high school, group life and problems in the Eastern Hemisphere, in the Western Hemisphere, and problems of citizenship in our own country and in other parts of the world.

Characteristic of several state and community revisions is the determination of areas of human activity. The Mississippi Program for the Improvement of Instruction (19) has nine areas: (a) "Protecting Life and Health," (b) "Making a Home," (c) "Conserving and Improving Material Conditions," (d) "Cooperating in Social and Civic Action," (e) "Getting a Living," (f) "Securing an Education," (g) "Expressing Religious Impulses," (h) "Expressing Esthetic Impulses," and (i) "Engaging in Recreation." These nine were selected after a study of thirty-eight classifications as derived by research investigations, students of society, and educational leaders. The nine areas serve as a basis for defining the general scope of the core curriculum and the centers of interest or emphasis. Similar areas of human activity characterize a number of other state curriculums, for example, Virginia, Missouri, and Indiana.

Jacobson (12) wrote that the faculty of the University of Chicago High School "feels that a vital reorganization of general education within the framework of the present subject matter departments can be achieved . . . it would include correlation as a method of teaching whenever or wherever it has meaning." Frederick (10) made an examination of books, research investigations, courses of study, and articles relating to research in curriculum construction, 180 of which were carefully selected and studied. He found that during the last two decades the combining of separate subjects into broad fields, such as science, mathematics, social studies, and language arts, and the correlating of work in different subject fields were two of the trends frequently mentioned. Broad subject field organization in general education rather than separate subject organization within a field is reflected clearly in the studies of the Commission on the Secondary School Curriculum (24). The needs of youth should determine the source and the organization within the broad fields.

Organization in Terms of the Problems of Youth

Organization of learning experiences that disregard subject lines is probably the most recent innovation. Aikin (1), reporting on the Eight-Year Study of the Progressive Education Association, described the endeavors of a group of thirty secondary schools to organize experiences on a different basis in general education or the core curriculum of the thirty experimental high schools and the effect of this training upon later success in college. "Almost all the schools were trying from the beginning of the Study to find ways of breaking down the artificial barriers which unfortunately separated teacher from teacher, subject from subject." Schools most experimental in nature deviated most widely from the attempt to "put subjects together." Stress was "upon the problems which young people face while

they are still *young* people, upon the concerns of high-school students while they are still in high school." This stress was upon "problems" and "concerns," with disregard to subjects as such. Aikin reported that "1,475 pairs of students were studied—those entering college in 1936, for four years; those entering in 1937, for three years; those entering in 1938, for two years; and the class entering in 1939, for one year." A pair consisted of one student from one of the thirty experimental schools and one student who entered college in the traditional college preparatory manner. Several conclusions are: "It is quite obvious from these data that the Thirty Schools graduates, as a group, have done a somewhat better job than the comparison group whether success is judged by college standards, by the students' contemporaries, or by the individual students. The graduates of the most experimental schools were strikingly more successful than their matchees . . . students from the participating schools which made most fundamental curriculum revision achieved in college distinctly higher standing than that of students of equal ability with whom they were compared . . . the assumption that preparation for the liberal arts college depends upon the study of certain prescribed subjects in the secondary school is no longer tenable."

Unit Plan of Organization

A decade ago Billett (5) found that unit organization of materials was one of the three general ways of providing for individual differences in secondary schools. Today's educational literature on the unit is astoundingly voluminous both in the discussion and production of units. The Morrison concept (20) of unit organization has expanded to mean "all things to all men." Whatever the external framework of recent organization may be, the internal arrangement is generally in terms of units. Unit organization is actually inherent in any arrangement wherein terminology includes topics, problems, or projects. A unit encompasses logical or psychological approaches. From blocking a subject off into logical and unitary divisions all the way to treatment of areas of experience of vital concern to youth, the unit has stretched and held its name intact.

Frederick (10) found there was a "trend for the core curriculum to be organized into units of experience based on significant situations, phases of life, interests and needs of pupils, or problems which pupils now face or will face in the future." Mackenzie (18) reported that secondary schools in California which had made significant progress in reorganization of their programs in the core curriculum used the unit organization within subjects or in problems of life or areas of experience.

Activity Programs and Organization

While no standardized sequence of school experiences holds in activity programs, there is the tendency for these programs to deviate little or much from the customary subject treatment. Dissociated from the pure activity

in learning, the programs include topics, imaginary trips, projects, problems, units, and other ways of organizing experiences in terms of pupils' needs, interests, and abilities.

Jersild and others (13) reported on one of the early evaluations of the large-scale experiment with the activity program in the elementary schools in New York City. They defined activity education as a "program based upon units of pupil activity as a substitute for and supplement to the traditional textbook learning." This experiment was started in 1935 in seventy elementary schools and continued for a period of six years. The report is based upon evaluation of eight control and eight activity schools comprising Grades IV, V, and VI. Early testing indicated that "activity classes consistently surpass control classes in quality of cooperative, critical, experimental, leadership, and self-initiated activities; children in the activity classes lag appreciably behind children in the control classes in some of the educational outcomes which are measured by an achievement test of academic skills, mainly arithmetic and spelling." Morrison (21) also reported on a follow-up survey of the New York City Activity Program made by the state education department by request from the New York City Board of Education. A fuller statement appears in the chapter on "Activity Education," which follows. The Progressive Education Association committee to report on evaluation of newer practices in education (25) found that "where schools have adopted newer educational practices the children learn as much of the ordinary school subjects as they would otherwise have learned. Sometimes they learn slightly less and sometimes slightly more, but the differences are small. . . . Where any measures have been applied, there is a definite gain in terms of initiative, skill in dealing with problems, knowledge of contemporary and world affairs, and social participation."

Organization of Courses of Study in Three Fields

Bruner (6) had access to eighty-five thousand courses of study on file in the Curricular Laboratory and Library of Teachers College, Columbia University. His study, which covered a period of five years, was limited to an analysis of the outstanding courses in social studies, science, and industrial arts from 1930 to 1940. His findings were as follows:

Science—Emphasis on the logical development of subjectmatter, with its resulting narrowing effect on scope, was most noticeable in the specialized sciences, namely, physics, chemistry, and biology. All the courses in general science, with the exception of one, tended to emphasize functional values, with a resulting greater attention to social applications than to predetermined sequences.

Social studies—Eight types of social studies organizations were found: (a) separate subjectmatter organization (overwhelming majority of the 5,029 courses fell in this category); (b) correlation between and among different social studies areas; (c) correlation with other subjectmatter

areas; (d) modern problems organization; (e) broad-fields organization; (f) core curriculum organization; (g) guided experience organization (teacher guidance); and (h) pupil experience organization (growth of pupils through experiences in which they are keenly interested).

Industrial arts—The internal organization was of three types: (a) formal arrangement or combination of skills, processes, or knowledges; (b) sequential projects prearranged; and (c) project differentiated to meet individual needs.

Organization for Academic and Nonacademic Pupils

The Research Division of the National Education Association (22) received questionnaires from 1,062 secondary-school principals who expressed their opinions pertaining to provisions that should be made for superior students. A large proportion believed that superior students, whether in separate or regular classes, should be given especially enriched programs of work; the material should not be merely more of the kind given to average students but mainly the kind that will deepen and strengthen their understanding of the world and which will stimulate their superior powers of reasoning and invention. Opinions about ability grouping were evenly divided.

In their study of provisions for the educationally neglected (nonacademic, slow-learning) pupils, the National Association of Secondary-School Principals (8) advocated the development of modified courses and differentiated programs for the college preparatory, commercial, and educationally neglected pupils. Attempts to "dilute" the conventional subjects to suit individual differences have proved unsatisfactory.

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CHAPTER III

Activity Education

KATHARINE B. GREENE

Spread of Philosophy of Activity Education

ACTIVITY EDUCATION has spread rapidly during the last several years, as findings from the fields of psychiatry, psychology, and education have permeated the ranks of educators. The objective of education is now often seen as the development in individuals of a spirit of independence in solving the problems of life, through experiential understanding of the behavior and motives of themselves, their fellows, and the community; the development of rules in the attack on these problems; and the cultivation of attitudes for the confident approach to these problems. Locke's theory of the *tabula rasa* is at last being supplanted by the theory that the child is an active, reactive individuality, unique in himself—a theory which in American education can be traced primarily to the teaching and philosophy developed by John Dewey.

This change in educational principles has not been adopted wholesale; in its very nature it cannot be imposed from without. It has seeped through our educational program, appearing in many different places in established systems, as individual educators have become convinced of its validity. Usually it has come into conflict with dominant patterns of authoritarian discipline and frequently it has been the source of emotional conflict between its adherents and those who believe in the establishment of rule, authority, and discipline for the sake of discipline.

With its emphasis on the value of individual thinking and adaptation to the actual situation of each problem, the philosophy underlying activity education appears in as many different guises as there are situations and workers. It is therefore impossible to summarize the work done in rules which are universally applicable. Only the philosophy is general, while each educational application differs from every other application. No one stated application can be called the only true activity education. If educational practice becomes crystallized, we shall no longer have true activity education.

Since the Deweyian philosophy has seeped through to education from various points, there are many different levels of progress in its educational application. Some learning situations have just begun to respond to its influence, some are well enough along so that descriptions of them are available, and few of them have reached the level at which it is possible to compare results through analysis and research technics.

Working Concept of Activity Education

Since activity education appears in many different guises and on different levels, the following definition of limits has been used to determine what falls in this field. It is activity education when the teacher and children who are in the learning situation do the planning of the curriculum, select the methods to be used, and appraise the results, while all the administrative, research, and special resources of the school and community are called upon for help, but do not interfere by determining from outside exactly what is to be taught and how. In activity education, the center of thinking about educational problems and their solution is within the group, all other individuals and groups being secondary, revolving around the center. Better forms of activity education consider the community and appraise results realistically in terms of community value, but are not coerced nor hampered arbitrarily by conclusions of outsiders.

A rough rule of thumb for measuring quality of education in the group is to measure growth and change in the teacher, for no matter how much the group may ape forms of activity education it is not real if the teacher comes out at the same point at which he entered. There is much sporadic activity education carried on in standard schools, within limitations imposed by the requirements of the system and the community: good teachers under any system have believed that each child was an individual and have stimulated him to draw conclusions from his own experiences. A real loss to educational advance has been that often the teacher is not encouraged to continue his growth and that of the children, but is hampered by criticism and pre-formed judgments.

Treatises and Reports on Activity Education

Recent authors dealing with activity education in general are De Lima (13), Heffernan (34), Leonard and Eurich (25), Lane (24), Melvin (30), and Washburne (35). These volumes give good descriptions of practice in individualized activity schools, with general explanations of underlying theories. It is possible from these summaries to compare technics and results on a subjective basis. There are more limited reports which give practical advice in showing how activity education is carried on, as in *Educational Method* (14), Heise (17), and the San Diego monograph (41). In New York City, the Speyer School did early experimental work with the activity program. The conclusion of Pritchard and others (39) based on the work with slow learners was that there was no noticeable improvement in ability of slow learners through the methods used then. An article by Burton (11) gives a general summary of current educational attitudes toward activity education, and Baker (40) summarized activity education for the lay reader.

The New York City Experiment

This is the largest experiment in elementary activity education which has been carried on and evaluated by accepted research procedures. It has been reported in numerous articles (18, 20, 21, 22, 28, 29, 31, 42, 47, 49). The final statements made by the research workers carry weight. Jersild, Thorndike, and Goldman concluded (21:308):

While the control children seem to have a slight but statistically unreliable advantage as far as achievement in academic subjectmatter is concerned, the activity children surpass the controls in the frequency with which they exercise such presumably wholesome activities as leadership, experimentation, self-initiated enterprises, participation in oral discussion and the like. The activity children have more experiences and show more tangible accomplishments in the fields of the arts and crafts. The activity children, as already noted, also tend to be superior in tests that call for intellectual operations such as those involved in the Wrightstone tests of working skills, explaining facts, applying generalizations, current events, what you believe, and personality reported in the main body of the present study.

Morrison's survey (31) gives statistical tables for comparison of results in activity and nonactivity schools for mastery of skills and knowledge in the sixth school year; educational growth in fourth, fifth, and sixth school years; attitudes and behavior of the children; teachers and the activity program; and parents and the activity program. In the summary (p. 162) it is stated that:

In the mastery of knowledge and skills, three conclusions are supported by the data reviewed . . . : (1) the only statistically reliable differences between the two programs favor the activity procedure and are found in those areas affected by the latter's emphasis upon developing skill in critical reading, in the use of elementary research techniques and in the development of civic attitudes and understanding of social relationships; (2) in all but three of those areas of knowledge and skills wherein the differences found favored the regular program, improving the sampling of the activity program tended to lessen or to eliminate the difference; (3) the activity program may be continued and improved with reasonable assurance that children will gain as thorough a mastery of knowledge and skills as they would in the regular program.

One of the standard complaints about activity education by casual observers is that it is disorderly and children are not learning to respect authority. Morrison (31:163) stated:

The fear that the activity program might tend to cultivate a certain lack of respect for authority seems to rest solely on observed behavior of children in the early stages of transition from outward control by the teacher to inner self-control. In respect for school authority the activity children tend to excel. If the activity program has fostered less respect for the authority of the home the parents have not discovered it.

With regard to the development of such attitudes as could be measured at present, Morrison reported (p. 162f):

In the appraisal of the school's influence upon the attitudes and behavior of pupils outside the classroom, certain conclusions are evident: (1) pupils in the

activity schools like school better, find it more interesting, and tend more to carry its influence into their life outside the school; (2) pupils in the activity schools tend to excel and in some cases by reliable differences in such qualities as cooperativeness or working together, self-confidence or poise, lack of subservience, creative abilities, self-discipline and scientific outlook; (3) in developing respect for the authority of home and school, the two programs are almost evenly matched in the outcomes.

There is no attitude that the problem is solved and can be pigeonholed. Morrison (p. 164) said: "Much attention needs to be given to improving the activity procedure even in those schools that have been committed to its development. . . . Before they undertake its practice, teachers and principals need to give careful consideration to the theory of the activity program; yet a thorough understanding of its objectives is possible only through practice in trying to attain them in the school's work. . . . Teachers need expert assistance in obtaining mastery of the methods and techniques of the activity procedure."

Experiments on the Secondary and College Levels

Activity education has been described by a class which went through Ohio State University High School (36). The students reported (p. 296):

We have never had the feeling of having education handed to us already to be absorbed, but have been stimulated to the desire to learn, discover things in our own way, and think for ourselves . . . because it will be necessary for us to be a part of a democratic order, our teachers feel and have made us feel that we should begin to think and do for ourselves while we are young (p. 298). Because of the fact that we do not have a required amount of work, it would be possible for us to continue most problems indefinitely. This makes us feel that we could always go further and that our work is never finished. . . . Discipline has never been a very grave problem in our school, and we, as students, have never been very conscious of it. There is not a long list of hard-and-fast rules, but individual problems are taken care of as they arise.

The work of the Progressive Education Association in the Eight-Year Study (1) is the most extensive in the secondary-school field, involving thirty schools whose application of the principles of activity education ranged from slight variations of standard forms of education to radical innovations. Since college entrance is a recognized goal of high school, the experiment could not begin until some three hundred colleges agreed to accept graduates of cooperating schools on more flexible terms than are usual. Now the Association hopes that other secondary schools will be granted this same freedom to develop curriculums in keeping with the needs of students and the community. The Association proposes that, until colleges organize their own purposes and know what candidates should present to fit them for college, restrictions on high schools be lifted; that what is needed for college preparation should be worked out by high schools and colleges cooperatively; and that needed information about students should be presented to colleges by high schools through some means other than issuing certificates that certain courses have been taken.

The thirty schools say this about curriculums (p. 138): "First, every student should achieve competence in the essential skills of communication . . . and in the use of quantitative concepts and symbols. Second, inert subjectmatter should give way to content that is alive and pertinent to the problems of youth and modern civilization. Third, the common, recurring concerns of American youth should give content and form to the curriculum. Fourth, the life and work of the school should contribute, in every possible way, to the physical, mental, and emotional health of every student. Fifth, the curriculum in its every part should have one clear, major purpose."

Dean Hawkes reported on the college success of students from the experimental secondary schools (1: 149 f): "On the whole, the students from the Thirty Schools were superior to the control group. . . . So far as these data are significant, the students from the schools whose pattern of program differed most from the conventional were very distinctly superior to those from the more conventional type of school."

Lack of Appropriate Research Technics

The greatest amount of reported material on activity education is on the descriptive level. Here the work is still tentative and subjective judgments are necessarily used in appraising results. Research in many cases is hampered by several restrictions. There are too few students studied and far too short a time to justify statistical analysis; also there are too few research tools for the study of planned purposes of activity education. The lag in development of research tools means that while we are able to test adequately acquisition of knowledge (which is the goal of authoritarian education) comparing children's achievement in school A with that of children of equivalent ability in school B, in arithmetic, spelling, or reading, we cannot so readily compare the extent to which children have reached goals stressed by proponents of activity education. There are too few tools developed for measuring social adjustment, leadership, cooperation, intellectual interest, scrutiny of a situation for its true values, liking and understanding of individuals with different patterns of living, willingness to see and attempt to solve problems in living, and knowledge of when to use tools, according to one's ability and control of them.

It is a slow process to construct and evaluate tests in this new field. There have been several starts which are suggestive for later work. Anderson (3), Bavelas and Lewin (5), Brewer and Anderson (9), Heise (17), Jersild (19; 22, Part 2), Lane (24), and Lippitt (27) offer materials which may be worked up into objective measurement of the teacher's influence in educational situations. Anderson (3) Barker (4), Bingham (8), Finley (15), Heise (17), Jones (23), Lewin and others (26), Morrison (31) Murphy (33), and Wrightstone (49) give examples of various methods of measuring results which are stressed more by activity

than by nonactivity education. The development of research tools other than academic and intelligence tests, to measure contributions to growth of children by activity education, is a very necessary next step before further evaluation will offer us much new light on the comparisons of activity and nonactivity (or standard) educational procedures.

The Teacher and the Environment in Activity Education

While the teacher may be the most potent single force in the child's education, he is not the only one. There is a strong trend in activity education to recognize this fact. Teachers who wish to understand effects of the out-of-school environment on their children will find the work of Skodak (43) stimulating although later work does not confirm all the data. The influence of evacuation from danger areas was discussed briefly at a meeting of the British Psychological Society (10). The influence of Gestalt psychology on the study of social relations has great significance for activity education. Children's responses to democratic and authoritarian group atmosphere, described by Lippitt (27), showed marked differences in favor of democratic procedure in producing good social behavior in the children, efficiency in production, and continuing interest. Authoritarian procedure, however, was not a duplicate of the situation in the world in general, since the children did not feel that the sanctity of tradition was on the side of authority and did not feel that sense of service to an ideal which the authoritarian movement has sometimes successfully invoked.

Lewin, Lippitt, and White (26) have studied aggression under differing social conditions. An article by Zachry (50) considered effects of psychiatric interest on education, while a more theoretical article by Frank (16) clarified the impact of the social milieu on individual growth. Prescott's book (38) is source material needed by every activity teacher for understanding his function. While much psychiatric technic is not available for the layman, the educational process itself may be used for promotion of good mental health. Articles by Finley (15) on class structure, Bender (7) on group activities, and Curran (12) on art, all point out methods of utilizing educational facilities for analysis and improvement of mental health. The meeting of the British Psychological Society (10) represents a study of children's problems in wartime, the recognition of which will alter the attitude of teachers toward children in peacetime education.

Many standard elementary schools have gradually adopted activity procedures from successful methods used by nursery schools. Since authoritarian pressure to cover ground and impart information has not weighed so heavily on early elementary years, it has been easier to introduce new methods without censure. Centers for the study of preschool children have sent out trained workers whose influence on educational practice has been marked.

Learning Is Many-Sided Development

Three generations ago, in the United States, education beyond the first three or four grades was largely considered as professional preparation. Sixty years ago it was not possible to obtain a free secondary-school education in Brooklyn. When formal schooling was so limited in purpose, the majority of our population got their real education outside school. Now our free schooling has been extended to care for all educable persons well into the teens, but there is still a division between what the majority need and what schools offer. The idea that we are concerned with more than intellectual processes can be traced to the work of G. Stanley Hall. The "whole child" is a phrase which denotes at least lip service to this concept. Another analysis of children's problems in education was summarized by Olson and Hughes (37) as "Organismic Age." Olson's results showed that the learning rate is affected by several factors besides the commonly accepted one of ability. Jones, Conrad, and Murphy (23, 25) traced the relationship between development in emotional and social fields and learning. For all those who wish to follow developments in this field, the work of Murphy (32, 36) is an excellent guide. Strang (46, 48) offered a guide for teachers who wish to apply available technics to the study of children whom they are helping, while Jersild (19, 20) presented a picture of the teacher as a "whole teacher" (as children see him) and Brewer (9) presented tools which may be of use to the teacher in measuring his own effect on children. Bell (6) outlined some considerations of the nature of children and the learning process which teachers should know, and Stoddard (45, 47) drew conclusions as to relations between findings in child psychology and educational theory from his experiences in both fields. Research in development during early ages is exemplified by Anderson (3), Barker (4), Murphy (33), and Updegraff (48).

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CHAPTER IV

Philosophy of Education

FREDERICK S. BREED

Decline of Opposition to Philosophy

ONE WOULD HAVE TO BE AFFLICTED with a species of mental blindness who has failed to observe, during the past generation, that the reputation of philosophy among educators has been clouded with suspicion. Indeed, education as a field of study is not alone in this respect. In numerous areas where scholars ply their craft, the feeling has spread that philosophy represents a futile approach to the solution of the problems of the world. The "speculations" of the metaphysician have been unfavorably contrasted with the verifications of the scientist, and students in considerable number have turned their backs on philosophy, preferring to accept the faith of leaders who grew up in the same tradition as themselves and as unencumbered with a knowledge of the subject. For better or for worse, however, the resistance to philosophy is perceptibly weakening. The barriers to philosophic study are being swept aside. Evidence that a change of attitude is taking place can be found in the organization of the Philosophy of Education Society in 1941; the publication of the Forty-First Yearbook of the National Society for the Study of Education, Part I (3, 6, 11, 14, 15); and the decision of the editor of the REVIEW to admit a chapter on this subject.

Prior to these events a situation developed that had a more deterring effect on the opposition than any of them. This was the unmistakable demand for improvement of the instructional approach in the classrooms of the country, reflected in the progressive movement, and the fact that the principal inspiration for this demand had its origin in philosophy. It shortly dawned on intelligent observers that the experimentalism upon which the new movement was based had a broader foundation than the experimentalism of educational science as currently pursued, that the reform under way could not be properly appraised until it was understood, and that it could not be understood without a degree of competence in philosophy. Thus seems to be explained the recent rejuvenation of philosophy as an educational discipline, a discipline that in no way impugns the findings of science but, on the contrary, takes them wholeheartedly unto its bosom.

Numerous Philosophies of Education

Before entering into a discussion of the broader foundation for educational thought provided by philosophy, it seems proper to devote a

moment's consideration to the title of the present chapter. One may champion the value of philosophic reflection, and indeed have a cherished philosophic outlook of his own, but still lack the presumption to offer this outlook as the only hope of salvation for educators. The possessor of the outlook may believe nothing less, but others will easily be found who believe something else. Accordingly, no trace of dogmatism lurks in the title for the chapter; the caption is intended only to suggest a deep felt need for a clarification of the basic ends of democratic education. It implies a latent confidence that by giving thought to this problem, with all the resources of knowledge available, the major purposes to be achieved in the schools can be brought into clearer light so that energies now scattered may be focused for their realization.

For years Dewey was so exclusively prominent as an educational philosopher that it was natural for many to conclude that the only philosophy of education they knew was the only philosophy there was. But even then Dewey made no claim that his instrumental pragmatism was more than *a* philosophy of education. Today educators are in a better position than ever before to appreciate the meaning of this fact, thanks to such timely publications as Brubacher's recent volume (7) and the 1942 Yearbook of the National Society referred to previously.

The pattern of a sound educational philosophy is logically inseparable from one's philosophy of life, and the latter may take any one of several fundamental forms or combinations thereof. These forms are quite familiar in the annals of philosophy and go under the names of idealism, realism, instrumentalism, scholasticism, and the like. The differences that obtain among these viewpoints stem mainly from different conclusions about the nature of the knowledge process.¹ Since this process, known otherwise as the thought process or the process of reflection, is central in education, it is clear enough that the same differences in theory of knowledge will also mark off the leading points of view in general educational theory.

Possibility of Greater Agreement

It is significant that while all the contributors to the recent National Society yearbook on the philosophies of education agree that respect for personality, for individuality, is the primary educational principle in a democratic state, they diverge considerably on the nature of religion and its relation to education, on the nature and function of discipline, on the notion of truth and its degree of authority, on creativity in experience and education, on the instructional approach to be employed in the schools, and, lastly, on that extremely crucial topic, the nature of value, general as well as educational.

¹ The writer has discussed the points of difference between instrumentalism and realism in the yearbook referred to, p 87-138. This is a family quarrel which is forgotten by these empiricists whenever absolutism, their common enemy, appears.

It is apparent that the present situation in the field of educational philosophy calls for a high degree of tolerance and patient comparison of views. It is surprising that Brubacher (6) did not find more points of resemblance among the different educational philosophies which he examined. As discussion proceeds, however, it is not too optimistic to expect that points of difference that spring, as many do, from lack of information, misinterpretation of fact, inconsistency of thought, and the miscomprehension of opponents will tend to disappear. If so, areas of agreement should be enlarged as the various outlooks are more fully explored.

Persistence of Fundamental Differences

Exploration has already gone far enough to show, however, that the leading outlooks on the world and education are each founded on relatively few fundamental propositions known as assumptions or presuppositions. Such propositions are neither God-given revelations nor absolute truths achieved by human intelligence, say the empiricists; they are but generalizations from experience—hypotheses, if you will, supported by belief. It is not difficult to see how such fundamental principles operate in the lives of those who take them seriously. They naturally give rise to different ways of looking at life and education. The devotee of the Absolute lives in a world serenely guaranteed, where all is well from everlasting to everlasting, even if he occasionally leans back in his easy chair, lights up a cigar, and takes a moral holiday. By the same token the pantheism of Mary Baker G. Eddy excludes the reality of evil and explains the familiar attitude of the faithful toward error and disease. Similarly, the scientific determinist has no room for ethics in the sphere of human relationships, for it consistently disappears in a mechanical world controlled throughout by natural causation, as he defines it. In contrast, many realists and pragmatists have achieved a deserved reputation for being tough—rather than tender-minded because they are consistently prepared to face the tribulations of the universe with no greater revelation than natural knowledge, no better guide to conduct than human intelligence, no more certain guarantee of salvation than human effort. For this variance philosophers are disparaged in certain quarters, even though physical scientists in the same manner and for the same reason hold different hypotheses regarding the nature of light, biologists are divided on the causation and extent of heredity, and psychologists are at odds concerning behaviorism, the proposals of the Gestaltists, and the nature of consciousness itself.

Democracy Must Decide

The moral of these examples is not far to seek. They suggest clearly enough that the facts in our possession are not everywhere susceptible of an unequivocal interpretation. Important controversial issues still divide the ranks of scholars in all fields, and with the differences in concepts are

correlated differences in practice. Where an issue is thus in doubt, a democracy can either allow competing views to flourish unmolested in the spirit of an easy tolerance or by majority vote select and reject as seems most beneficial for the interest of society. It is a mistaken notion to believe that education should proceed according to the doctrine of *laissez faire* while economic and political interests are being subjected to control. Education functions as a part of the general social fabric. The national system of education should be analyzed with a view to determining the major ends to be achieved, and these ends, with popular approval, should become the distant goals of instruction in the schools, subject always to modification dictated by experience, including, of course, the results of research. Unanimous support for an objective is no more necessary in education than it is in politics. In either case, the opinion of the majority should prevail. The important democratic consideration is the open door to truth, the essence of a true progressivism.

At this juncture the reader may be disposed to scratch his puzzled head and opine that the immediately foregoing statement has a peculiarly familiar ring. "I have it," he may finally affirm, as a faithful memory harks back to the scholasticism of Mortimer Adler echoing through the racy ironical pages of *The Higher Learning in America* (12). It is true that we are anticipating a more definitive, a more positive, organization of public education, just as Hutchins is striving for a similar reform in higher education, but with a distinction in methods of approach that marks a tremendous difference.

The Decision of the Modern Scholastics

The framework of the Hutchins reform rests on the philosophy of St. Thomas Aquinas. More broadly, it is built on the philosophy of absolutism. Adler acts as a modern exponent and interpreter of this philosophy. Hutchins concerns himself largely with the educational applications. The product of their endeavors has received acclaim from the high priests of Roman Catholicism because Thomism figures so prominently in the official philosophy of the Catholic church (15). The program of reform has been scorned by empiricists as medievalism because it is a reversion to scholasticism. It is also a reversion to Aristotelianism through St. Thomas Aquinas.

In the Hutchins proposals empirical thinkers, including the scientific group in education, can find much to approve. Emphasis on the interest approach, on the historic contributions of human intelligence, on the integration of college departments, and even on the warmly debated 6-4-4 plan need not be occasion for alarm to empiricists, or so it seems to the writer. But many of the most progressive adherents of this philosophy stand adamant against the metaphysical core curriculum proposed for adoption at the University of Chicago.

Empiricism versus Absolutism

The frustration of the reformers on the home front is a direct result of a serious clash between two fundamental philosophies of life. Adler and Hutchins make a sharp distinction between philosophy and science; their empirical opponents make no such distinction. With the former, philosophy provides a technic for laying hold of absolute truths, with the latter, the principle of induction is still the foundation of all knowledge, and the relativity of truth its natural and accepted consequence. According to the empirical doctrine, philosophy is but a venture in the direction of greater generality of thought. The "clear and distinct ideas" that pass with the absolutists as revelations of the cogitation of Almighty God are regarded by the empirical group as impressive examples of self-deception and misinterpretation. The latter group are yet to be convinced that there are any self-evident truths in the sphere of term-thing relationships, which includes the basic knowledge of science. This is not to say that basic relationships discovered by experiment and expressed in mathematical form may not be used by an Einstein for the discovery of relationships hitherto unknown. This technic is a commonplace with mathematicians. But the conclusions reached can never be more secure than the facts assumed as a basis for the proof, and these are characterized by their relativity, which means that they are subject to revision as research proceeds.

Some of the obscurity that hangs over this theoretic struggle like a fog can be dissipated if the crux of the problem is more definitely identified. To the writer the fundamental issue arises from different conceptions of the nature of value. This statement of the problem covers not only the value of truth but value in general. Adler charges that the present-day empiricists ("positivists" to him) have brought modern culture to the brink of ruin through their impotent skepticism. He is irked by their insistence on applying scientific rules of evidence to his proposals for their redemption, when the fundamental values of human experience, according to him, are not empirically established. These values include the ends, objectives, or goals of education, hence the general alarm in educational circles.

An Empirical Theory of Value

The empirical conception of the determination of value can be briefly described, even if it cannot be adequately discussed, within the narrow confines of our allotment of space. To avoid ambiguity it should be observed that the term "value" is commonly applied to that which is valued as well as to that which confers the status of value. Let us abstract, for the moment, from the question of determining *what* objects or, more broadly, experiences are valuable, and note, if we can, *how* their value is achieved. In what, the question is, does their value reside?

Let us hark back for a moment to the value of truth. A truth is a belief,

say the empiricists, that has been verified by experience; but the verification is not the evaluation, else the professor who bases his profession on useless knowledge, without professing to do so, would never have won his present unenviable distinction in comedy and the comic strip.

Value as known this side of heaven is a product of human reaction. Nothing, as far as known, seems to have value in itself. The attitude of man to an object or event determines its value. Value, that is, is attached to an object by virtue of a type of external relation to humans. Fundamentally, a thing is said to have value if it is attractive to humans; and that is attractive which attracts. Some empiricists express this basic notion in terms of interest (17); others employ such terms as preference or desire or demand, but no divergence of view worthy of note is reflected in the phraseology. Pursued somewhat further, the roots of value are found hidden away in the reactions of selection and rejection, in the positive and negative responses of the organism to the elements of its environment. It is appropriate, therefore, to speak of positive and negative value. For citizens of the United States democracy possesses the first; totalitarianism, the second.

The Failure of Infallibility

In the educational controversy with which we are concerned, it now becomes important to devote attention to the things that are valued. Under this category belong the fundamental objectives of education. In the choice of ends one may rely on the purportedly infallible reason of an Absolutist, on a conception of reasoning borrowed from the ancients, or one may proceed in terms of the conclusions of modern psychological science regarding the nature of the reasoning process in man. The modern scholastics, however, show little interest in the James-Dewey tradition in scientific psychology, preferring exegetical studies of Aristotle, Aquinas, and St. Augustine to illuminate their pathway. Challenged to produce infallible selections of educational ends, "evident or self-evident truths that can be affirmed without demonstration," they have illustrated their mode of procedure in a series of syllogisms which leaves one as much in doubt as the classic "proofs" of the existence of God. It will be interesting, if not astonishing, to note that their quest for certainty is pursued with undiminished confidence, even though the "proof" at various points rests "upon certain evident truths known by intellectual observation of existing facts." It is not surprising, therefore, that Adler terminates his effort with the admission that "no adequate demonstrations have been completed" (1).

Scientific Determination of Value

The empirical school of thinkers finds the value problem in the field of existing facts. Humans are observed to assume a specific relation to

objects, known as the value relation. The situation can be symbolized in the expression $A \ r \ B$ in which A and B signify the terms related and r represents the relation. All three elements in the situation are regarded as objective—discoverable existents in the external world. Hence, say the scientists, value is a legitimate subject for objective investigation. The difficulties of research in the field are practical, not theoretical. The problem becomes one of identifying the fundamental interests of humans. The uncertainty of scientific truth is no sufficient warrant for deserting the scientific method. Interests lie in the open field of observation and are already being extensively studied. They will no doubt be more extensively studied in the days to come. Better and better ways will probably be devised for determining whether the individuals in a given group or in the nation at large are interested in a given objective, and whether they are more interested in it than in certain other objectives.

An end, when and if achieved, is conceived as a state of human welfare, a condition in social life. If one proposes prohibition of the sale of intoxicating liquor on a nationwide scale, we are confronted with the question, How will it probably affect the general picture of social life? If dependable data relating to its effects in this or other nations are available, these data are consulted first. Then are canvassed the considered opinions of persons whose experience and training seem to give them a preferred position as judges. Finally, with such information before them, the population in a democracy or its political representatives are polled. The vote is taken as an approximate measure of value. Thus in a democracy are political and economic ends selected, though seldom educational ends. The latter are usually left to representatives of the people in a legislature or a board of education, after a recommendation by an assumed expert. But it is neither improper nor inconsistent with the democratic tradition for great educational issues to be taken to the people for decision.

Which reminds me of an absolute idealist who created a considerable stir in psychology during the early years of the present century—Hugo Münsterberg. It is painful to recall, for example, how one evening in his seminary, Münsterberg administered a *coup de grâce* to democratic government with the impressive assertion that one cannot derive the truth from a majority vote. And so, apparently, we did not in the postwar adoption of prohibition. But nobody imputes clairvoyant insight to the maker of an American ballot. His vote for prohibition was a positive reaction reflecting a readiness to undertake an experiment which might or might not eventuate in keeping with his evaluation. It is a privilege of a democratic citizen, as it is of a scientist, to alter his attitude as new facts develop. Thus values, like truths, are arrived at by experiment. Whether the democracy shall be "wet" or "dry," indeed its form in general, we believe, should be determined by experiment. This is an impossible method for one who is obsessed with the infallibility of his own ideas in the discovery of ends and would be limited to the discovery of means.

A Crucial Educational Problem

The most vital question in education today concerns the direction of its orientation. When the ends are determined, the orientation is determined. If the ends are selected by the cult of the infallible, what is in store for the curriculum but the stagnation of a dogmatic religious creed? The proposal to inquire into the fundamental principles of the various sciences and to investigate the interrelations among the sciences, with a view to a better grasp of the organization of human knowledge and thence of the foundation of the curriculum, indeed to organize a special faculty to conduct such research to this end, need not strike terror to the heart of any scientific educator. He should favor the extension of scientific study to the fundamental concepts employed or implied in his and other subjects. But this program of research can be carried out in an empirical or scientific universe of discourse and indeed is now under way on an international scale in the unity-of-science movement. The real threat to scientific interests lurks in the personnel of the "metaphysical" faculty. If the court is packed with the cult of the infallible, the nature of the decisions can safely be forecast.

If justification were needed for the rather lengthy discussion of the Chicago situation, it may be found not only in the wide interest taken in this situation but also in the fact that the problem involved suggests the need for the type of fundamental inquiry which was hereinbefore defined as the philosophy of education.

Humanism and the Causal Law

The pragmatism of James (13), the instrumentalism of Dewey (8, 9, 10), the experimentalism of Kilpatrick (14), and the organic realism of Whitehead (19) are all empirical philosophies. They accept the unity of science and philosophy. They rely fundamentally on generalizations based on particular experiences. In fact, all four of these outlooks may be described as generalizations of the scientific method. Where they diverge one from another in educational theory, or elsewhere, the divergence is mainly due to varying interpretations of available fact. Lastly, each of these philosophies may be described as humanistic, and so moralistic. They are philosophies of restrained optimism, but they are melioristic in their attitude toward human life and social problems. This means that they entertain a theory of the possibility of human betterment through moral action as over against a common interpretation of causality, supposed to be scientific, which pictures measures of human uplift as futile gestures and morality as an empty dream—as idle as a painted ship upon a painted sea.

In drawing toward the close of the chapter, it should be helpful to hold a problem up for brief examination, a problem which too few have boldly faced and one which Russell (18) says may end by disrupting our civilization. The problem may be stated as follows: Can one entertain a

scientific conception of natural causation and consistently believe in freedom, morality, and humanitarian effort? If there is no freedom there can be nothing deserving the name of morality, and endeavors toward human uplift become illusory incidents in a vast complexity of cosmic weather. The problem should be faced by every educator who prides himself on the rationality of his outlook.

Trend Away from Scientific Determinism

The philosophy that underlies the notion of scientific determinism usually envisages a physical world composed of inert material objects related in a system of push and pull, attraction and repulsion, where man finds his place as one of the objects, possessed of a conscious life that accompanies events in his material organism as inertly as a shadow follows him in the sunshine. Essentially the same materialistic view colors the thought of one who believes in a universal "reign" of causal law.

This approach to the problem has rapidly lost ground among many of the distinguished thinkers of our time. In the first place, the conception of matter as an inert substance or as a substance of any kind is now widely discredited. Whitehead reflects the trend of modern thought in the view that there are no "vacuous entities." Moreover, human vassalage under a "reign of law" tends to disappear with the modern conception that science is descriptive rather than explanatory. The law of gravitation, for example, is descriptive in the sense that it merely expresses the spatial-temporal relations observed when bodies fall. To say that gravitation is the cause of the event observed is a prevalent and peculiar inversion of thought. A law of gravitation, expressed in mathematical form, is a description of the behavior of an entity in relation to another entity.

Whether the entity has the relative simplicity of an electron or the relative complexity of a human body, it can be conceived as an active organism possessing characteristic modes of behavior, modes of response to other entities. Science investigates these modes of behavior, but, ultimately, stands in baffled silence before the question, What explains the action? The behavior pattern dictates the law, not the law the behavior pattern. The present program of science is complete when the form of the entity and its reaction system have been mathematically described.

What Is Freedom of Conduct?

What is freedom in a world so constituted? In such a world the freedom of an entity seems to be satisfactorily defined as the absence of external determination. That is, one is free if not deterred by external circumstances from acting as one wills. This but reaffirms a conclusion previously published, with which the chapter may be brought to a close:

To discover what hydrogen does in the presence of oxygen explains in no way the doing. The event is simply found by science and recorded *post rem*. Do atoms,

like the moon, shine from borrowed light? Are they mere unwinding clocks? What principle of rationality requires one to believe that energy is forever borrowed from elsewhere, or from some single pervasive source? The secret of that which is observed is hidden away in the elements themselves, for aught that science teaches. Thus are oxygen and hydrogen said to have certain ways of acting, certain modes of behavior. Refer to them as bonds, or affinities if you like. These are theirs, attributable, so far as known, to nothing elsewhere. And, if the simplest element conceivable reacts independently in the simplest way possible toward any other element, there is freedom of action. Freedom of action is freedom to act. It means the opportunity to act in accordance with one's nature, the opportunity to be oneself (5).

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CHAPTER V

Methods of Teaching

STEPHEN M. COREY and VIRGINIA MOOK

THE CONCEPT OF GENERAL METHODS OF TEACHING is so broad as to need empirical delimitation in any summary of research data. In one sense the teacher's method includes everything that he does in the classroom as well as the maintenance of many nonclassroom conditions that affect learning and over which the teacher has some control. Broadly conceived, part of the teacher's instructional method might involve his ability and willingness to regulate the amount of fresh air in the room. The term is not so broadly defined, however, in the pages that follow. They summarize the research reported within the past three years which has been concerned with evaluating the relative effectiveness of certain general procedures employed by teachers. The best practical definition of these general procedures or general methods is the following list of names that have been applied to various ones of them—the activity method, the case method, the conference plan, the demonstration method, the discussion method, the laboratory method, the lecture method, the problem method, the project method, the seminar method, supervised study, the unit plan, and the recitation method.

Each of these methods has been variously described. One of the chapters in this REVIEW is devoted entirely to a consideration of the "activity method." Consequently, the considerable body of literature in this area is omitted here. Inasmuch as any investigation of general methods always involves some particular instructional materials or subjectmatter, the line between "general" and "special" methods is a vague one.

During the three years 1939, 1940, and 1941, few research articles dealing with general methods were published. Under eighteen different headings in the *Education Index* there were forty titles so worded as to imply research, but of this total only fifteen reports actually involved scientific investigation. While there was a rather large number of titles such as "An Experiment with the Project Method," "An Experiment with the Laboratory Method," or "An Experiment with the Lecture-Demonstration Method," the word "experiment" was used loosely. Statistical data were not reported and the experimenters usually confined themselves to discussing the relative merits of the various methods and describing subjective impressions of effectiveness.

Classification and Use of Various General Methods

Monroe and Marks (12) classified the various general methods of teaching, as named previously, under the following headings: (a) the

lecture method, which consists primarily of extended discourse by the teacher supplemented by assignments; (b) the recitation method, involving an emphasis upon extended questioning of the pupils by the teacher; (c) object teaching, or the frequent use of concrete, tangible objects such as animals, plants, and colored cards, which pupils observe and study and about which the teacher asks questions; (d) the developmental or Socratic method; (e) the laboratory method, in which the classroom becomes a workshop furnished with the tools of living; (f) the project method, in which the pupil "purposes" to do something voluntarily or as the result of stimulation by the teacher and in which all the learning is related to this purpose; (g) the problem method, in which the teacher makes the assignment in terms of a problem and thus directs the situation; (h) the socialized recitation, which involves a considerable amount of teacher-pupil cooperation and extensive use of discussion technics; and (i) the Morrisonian unit-mastery procedure. This last is most commonly found at the secondary level and involves pretesting, teaching, testing the results of teaching, adapting the procedures, teaching and testing again to the point of actual mastery. Monroe and Marks agreed that the distinctions between these various methods were in many cases artificial and that during one class period a particular teacher often employs a variety of methods in order to attain a given end. Bumatay (1) circularized a large number of teachers in Texas elementary and high schools to find out the extent to which various methods were (reported as being) used.

The most extensive investigation of certain consequences resulting from use of the various general methods in high school was reported by Edmiston and Braddock (4). Pupil-attention was measured by trained observers using the procedure suggested by Morrison. The four methods which produced the best attention were, in order of efficiency: student reports, demonstration, pupil-dominated general discussion, and workbook.

Project Method

A committee appointed by the Progressive Education Association (14) generalized favorably upon results from sixteen research studies concerned with the relative effectiveness of "newer" methods of teaching involving numerous projects versus various other methods. Heaton and others (7) have shown that teachers who attend summer workshops in which the project type of learning is emphasized subsequently modify their instructional behavior markedly. There was a tendency for workshop participants to place greater emphasis than did other teachers upon the importance of changing their courses in order to make them better adapted to the present needs and interests of pupils.

Lecture, Demonstration, and Discussion Methods

Degering and Remmers (3) reported upon the relative effectiveness of individual laboratory work and the lecture-demonstration method in the

teaching of organic chemistry to home economics students. While the measuring technic employed was approximate and subjective, the authors found that the lecture-demonstration method was effective and they urged its adoption in view of the amount of money that would be saved in comparison with the individual laboratory method. A second investigation of the lecture-demonstration method versus the individualized laboratory method was conducted by Steen and James (15) and involved the teaching of physics. These authors reported that for high ability students the lecture-demonstration method was superior whereas students of lesser ability learned more effectively when they were given opportunity for individual laboratory experiences. A third study of the relative effectiveness of the lecture-demonstration and individual laboratory work was made by Elder (5) in chemistry. The research data included mostly statements of opinion by a large number of teachers, such as: "Do you believe that beginning chemistry can be taught effectively without individual laboratory work?" Sixteen percent of the respondents said "Yes" and 84 percent said "No."

Using the radio method of presentation, Lohmeyer and Ojemann (9) determined the relative effectiveness of three types of oral presentation for developing functional concepts and related attitudes. Sixth-grade children were used and the following three content areas: history, science, and literature. The three methods employed were (a) straight talk in the second person, (b) informal discussion using several voices, and (c) dramatization. The conclusions were that the talk and dramatization methods were significantly superior with respect to all types of subjectmatter and all groups of subjects.

Group Discussion

Miller (11) investigated the group discussion method in an advanced course in educational psychology. He recorded all responses for each discussant during twenty class meetings and then compared the five best students with the five poorest students in terms of the different types of comments made. As a result of his analysis, Miller recommended that in order for class discussions to be most effective, teachers should (a) encourage students to express the opinions that they already have on the problem under consideration, (b) encourage students to locate specific problems for discussion, and (c) provide opportunities for the interpretation and organization of newly acquired information. Zeleny (16) reported the results of a study of the effectiveness of the small group discussion method in sociology as compared with the more conventional large group discussion-recitation method. In the former, the larger groups were broken down into several small groups of five students each. All of Zeleny's differences were in favor of the small group procedure, but in only one out of approximately twenty cases was the difference statistically

significant. The students reported that they enjoyed studying sociology more when there was opportunity for small group discussions.

Unit Method

Ellwood (6) evaluated the unit-directed study procedure in the teaching of modern history in high-school classes. His method consisted of the following cycle: presentation, directed-study period, discussion, and a test. A control group was taught by the traditional recitation method and special tests were constructed to measure understandings, attitudes, interests, and skills. Despite the low critical ratios which resulted from the data, the author concluded that the unit-directed study procedure is apparently superior for developing understandings and skills, the recitation method is evidently better for developing attitudes, but no definite conclusions can be drawn as regards interests.

For a number of years Michener (10) has experimented with a modification of the Morrisonian unit plan. Thirty-three experiments were conducted in various types of schools, using subjects from the sixth-grade to the graduate level and involving material from numerous subjectmatter areas. Michener's plan includes the following five steps which he believes are not adequately emphasized by Morrison: group study, individualization, generalization, action, and evaluation. The author concludes that while his method is satisfactory in all grades, it seems especially well suited to social studies courses dealing with problems and in which the major objective is modification of behavior. The method is less successful when used in connection with units in which the major objectives are appreciations or the acquisition of skills. Michener warns that the method is useless in the hands of weak teachers.

Individualized Teaching

Olson and Kambly (13) investigated the relative effect of the following three types of teaching upon the learning of general science by ninth-grade pupils: (a) group instruction, during which the entire group usually engaged in the same activity; (b) individualized instruction, in which the teacher aided individual children and tried to differentiate suggestions in terms of their needs; and (c) a composite method, in which pupils went along on their own but received help when they requested it. These authors concluded that the method in which youngsters were given individual help whether or not they asked for it was most effective.

Inductive Method

Katona's monograph (8) does not deal directly with methods of teaching but his findings are of some pertinence to the topic. He conducted a long series of experiments involving the relative effectiveness of learning

by memorizing and learning by understanding. The latter usually involved induction and was defined as "the organization or reorganization of the given material by the learner." His experiments involved a great range of materials from tricks with cards and match sticks to an understanding of economic principles. His chief conclusion was that learning by understanding is superior to learning by memorizing if retention and transfer are the desired objectives.

Conclusions

A review of the research dealing with general methods of teaching might well conclude with a quotation from the *Encyclopedia of Educational Research* (2), "The experimental research relating to patterns of instruction is subject to a number of criticisms. The experimental factor is complex, in some cases curriculum reorganization being involved; the control of non-experimental factors, especially teacher skill, zeal, and enthusiasm, is seldom adequate; the measurement of the outcomes of instruction is rarely satisfactory; and the period of experimentation is usually not long enough for the pupils and teacher to become adjusted to a new method. Furthermore, all the patterns of instruction are not intended to serve the same functions. For example, the arguments advanced for the 'project method' emphasize outcomes that are not claimed for the 'recitation method' and the 'lecture method'" (p. 726).

The authors of this chapter in the REVIEW are of the opinion that the research in general methods during the period under consideration has not been fruitful. They are convinced further that the teaching situation is so complex that attempts to establish the relative superiority or inferiority of anything so amorphous as a "general method of teaching" are almost certain to be indecisive.

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CHAPTER VI

Radio and Records in Education

SEERLEY REID and DANIEL DAY

TODAY NINE-TENTHS OF THE HOMES in the United States contain radios, but less than one-half of the schools of the nation have radios. Most pupils, even today, go through school without ever hearing broadcasts in the classroom. Radio is of value in American schools and classrooms in various ways:

1. Classroom listening to school broadcasts produced by network organizations, radio stations, state universities, and local school systems.
2. Classroom listening to educational records and transcriptions.
3. Classroom or auditorium listening to general broadcasts on the air during school hours, for example, speeches of the President or other public leaders, openings of Congress, symphony concerts, and news broadcasts.
4. The educational use in classrooms of programs broadcast during out-of-school hours.
5. Radio courses, units, or clubs in science, speech, dramatics, social studies, and other subjectmatter areas.
6. The presentation of school sponsored programs, usually with student performers, over local radio stations.

Literature Dealing with Radio ¹

To those interested in developing an understanding and an appreciation of the potentialities of radio as an educative medium, there are a number of excellent references. These may be divided into seven groups. In a first group are various books dealing with the writing and production of radio programs, as (7, 20, 79, 130, 152, 168). While such books are probably most valuable to high-school teachers directly concerned with radio workshops, they offer suggestions to all teachers interested in using the technics and methodology of radio in vivifying ordinary classroom procedures. A second group of references consists of radio dramas and radio discussions (15, 26, 27, 64, 83, 97, 98, 99, 150, 151, 166, 167). In addition to plays there are available printed transcripts of such series as "America's Town Meeting of the Air," "University of Chicago Round Table," "American Forum of the Air," and "Invitation to Learning."

The present world crises and the prominence of radio news analysts and commentators will undoubtedly increase the importance of a third category—that of the personal experiences and interpretations of radio journalists. Already a number of such books have been printed (57, 61, 92, 126, 127, 128, 129, 131, 138). In a fourth group are numerous books and

¹ Although this is the first general treatment of radio and education in the REVIEW there have been a number of sections on radio in connection with particular phases of education. Studies reviewed in these earlier discussions have been eliminated from the present chapter. For earlier treatments see the following: 11 412, 453, 10 13 118, 215 434, 8 36 44 383, 7 68, 6 315, 489, 4 470

pamphlets which deal with the development of radio policies and practices in the United States, such as (16, 19, 37, 38, 46, 48, 66, 68, 93, 122, 123).

Fifth, there are publications of organizations devoted to the promotion of educational radio: the twelve yearbooks (1930-1941) of the Institute for Education by Radio, the five yearbooks (1931-1935) of the National Advisory Council on Radio in Education, and the three yearbooks (1936-1938) of the National Conference on Educational Broadcasting; pamphlets and documents of such organizations as the Federal Radio Education Committee (12, 39, 40, 41, 103, 104), the U. S. Office of Education, the National Advisory Council on Radio in Education (21), the Evaluation of School Broadcasts (76, 77, 90, 101, 107, 108, 110, 111, 112, 113, 114, 116, 117, 119, 124, 154, 155, 156, 160, 161, 162, 164), the School Broadcast Conference, and the Committee on Scientific Aids to Learning; and regular bulletins and newsletters of the Federal Radio Education Committee (42), the National Committee on Education by Radio (95), the Bureau of Educational Research (Ohio State University) (74), the Columbia Broadcasting System (24), the Mutual Broadcasting System, and the National Broadcasting Company (94).

In a sixth group are various magazines and magazine issues dealing with radio—the three trade journals, *Variety*, *Broadcasting*, and *Radio Daily* (106); the annual volumes, *Radio Annual* (106) and *Variety Radio Directory* (145); the miscellaneous “fan” magazines such as *Movie and Radio Guide* and *Radio Stars*; and the newly established journal of the Association for Education by Radio. Entire issues of several magazines have been devoted to the educational, psychological, and sociological aspects of radio (2, 35, 36, 59, 60, 102).

Seventh, there are various references devoted to the problems of using radio in school (10, 30, 41, 51, 54, 62, 65, 75, 96, 120, 159).

Research and Summaries of Research

During the last ten years there have been several hundred investigations dealing with the uses of radio in school and classroom. Unfortunately, many of these studies have been superficial, inconclusive, and uncoordinated with each other. Despite the excellent list of research problems suggested by Charters (21) in 1934, much of the research itself has been concerned with petty problems and has led to insignificant conclusions. Fortunately, however, during the last five years there have been three radio research projects, financed by the General Education Board and the Rockefeller Foundation, and two of them sponsored by the Federal Radio Education Committee of the Federal Communications Commission. The findings of these three research staffs—one at the University of Wisconsin, one at Ohio State University, one at Columbia University (formerly at Princeton)—have done much to answer questions puzzling broadcasters and educators.

In one of the best references on the methods of radio research, Lumley (78) examined with critical insight the research up to 1934. A year later Cantril and Allport (19) presented a series of investigations dealing with voice and personality, sex differences in radio voices, speaker versus loud-speaker, listening versus reading, and effective conditions for broadcasting. Wrightstone (165), with the assistance of the Evaluation of School Broadcasts staff, summarized the research up to 1939. Two issues of the *Journal of Applied Psychology*, February 1939 and December 1940 (59), both edited by Lazarsfeld and Stanton (69), presented research investigations completed during 1941. With so many investigations being carried on throughout the country, Beville and Daniel (12) suggested a classification of educational radio research.

Findings of the three radio research projects have been published as follows: Many of the investigations of the Columbia (formerly Princeton) Radio Project have been included in Lazarsfeld's discussion (68). The results of the Wisconsin study have been summarized in a report by Barr, Ewbank, and McCormick (8). At Ohio State University, the findings of the Evaluation of School Broadcasts staff have been published in mimeographed form in approximately fifty individual bulletins. The influence of these subsidized research projects upon graduate research is evident in the bibliography.

Radio and Sound Equipment in Schools

The first nationwide survey of radio and sound equipment in schools was made by Koon and Noble (63) in 1936. These investigators, in a survey of 82,297 schools, found only fourteen radio sets per one hundred schools and only one school in a hundred with a central radio sound system. Phonographs were more common, there being forty-six phonographs per hundred schools with, however, an average of only nine records per school. Equipment was found most frequently in the schools of New Jersey, Ohio, Delaware, Connecticut, and Massachusetts. Two years later, in 1938, Stanton (134), in a survey of 11,169 school teachers throughout the country, reported that 36.4 percent of the respondents had classroom radio facilities. Not satisfied with the representativeness of the respondents, Stanton sent out a follow-up questionnaire to nonrespondents and found that only 23.8 percent of the respondents to this second questionnaire had classroom radios. He concluded, "It is reasonable to assume an even lower percentage of ownership among the remainder of the sample from whom no replies were ever received."

A survey of members of the Departments of Elementary and Secondary-School Principals of the NEA, made by Reid (108) in 1939, showed that radios were available in 77 percent of the elementary schools and in 61 percent of the secondary schools. Probably the most reliable and comprehensive survey of radio equipment in schools is the one of Ohio made in 1941 by the Evaluation of School Broadcasts staff and reported by Reid

(114). Replies were received from 2,348 Ohio schools and data gathered so that replies of nonrespondents could be estimated accurately. The survey covered all public schools in the state—rural and urban, elementary and secondary, one-room and consolidated. Fifty-five percent of the schools reported having radios; 12 percent had central radio sound systems; 37 percent had record playing equipment. Other surveys of states have been made in Maryland by Barnes (6) and in Iowa by Denger (33).

In the survey of Ohio schools (114), principals reported these uses of central sound systems: reception of radio programs for classroom listening, broadcasting of administrative announcements, broadcasting of talks and speeches, and broadcasting of student dramatizations. In master's theses, Haynes (53) and Rudy (125) discussed the school uses made of sound equipment. In another thesis, Young (169) described the procedure, step by step, of installing sound equipment in a school. Probably the best discussions of equipment are the ones by Lowdermilk (74, 75, 77) in which he explained the actual and potential uses of radio sound systems and of transcription players, and the report by Hogan and Wilmotte (56) dealing primarily with the cost of auditory aids in the classroom.

What's on the Air?

There are in the United States three types of school broadcasts distinguishable by their geographical scope or coverage: (a) broadcasts of the radio networks available to schools in most states from coast to coast; (b) programs broadcast over a single station or a regional network of stations to schools in a single state or geographical region; and (c) broadcasts originating in individual cities and intended for classroom consumption in local schools. Most of this broadcasting is done by commercial stations rather than by educational stations. From 1921 to 1936, according to Frost (45), there were 202 licenses granted to educational radio stations. Of these 202 licenses, 164 were allowed to expire, were transferred, or were revoked so that on January 1, 1937, there were only 38 broadcasting licenses held by educational institutions.

There has been comparatively little descriptive and analytical research dealing with the school broadcasts of the Columbia Broadcasting System, the Mutual Broadcasting System, and the National Broadcasting Company. Probably the best descriptive analyses of network school broadcasts are those of Reid (107, 109, 111, 112, 116), Robbins (119), and Wiebe (154), who studied the five 1940-1941 series of the CBS "American School of the Air." From these studies they concluded that the broadcasts were generally and sometimes extremely valuable educational experiences, but that throughout the series there were numerous curriculum defects and deficiencies. They made these recommendations: (a) that responsibility for a nationwide school of the air be vested in an educational organization rather than in a commercial organization; (b) that the planning of the radio series be delegated to specialists in public-school curriculums;

) that network broadcasts be focused upon broad areas of knowledge and cut across traditional subjectmatter boundaries; (d) that broadcasts be construed in terms of the unique educational advantages of radio; (e) that all individuals responsible for the planning and producing of school broadcasts have a knowledge of classroom conditions; (f) that printed aids to accompany broadcasts be accurate and specific; and (g) that a continuous program of evaluation be carried on during a broadcast series.

In master's theses, Hayden (52), McHugh (80), Smith (133), Swineo (137), Taylor (140), and Wolf (163) gave partial descriptions of the broadcasting activities of radio stations, universities, and local school systems. In the most extensive survey yet made, Atkinson (3, 4) described radio education in 126 American cities. Darrow (29) sketched the history of school broadcasts. Darrow (31) also traced the development of the "Ohio School of the Air" which he founded in 1930. The story of the "Wisconsin School of the Air" has been told by Bartel (9) and in the report of the Wisconsin research project (8).

Criteria for Judging School Broadcasts

After a year's experience in listening to school broadcasts, Reid and Woelfel (117) listed a series of criteria under three general headings: educational value, clarity and comprehensibility, and interest and appeal to classroom listeners. In evaluating the 1940-1941 series of the "American School of the Air," Reid (107, 112, 116), Robbins (119), and Wiebe (154) used these criteria. In an appraisal of an NBC series, O'Steen and Miles (101) used similar standards, but in an evaluation of sixty school broadcasts submitted in the Fourth Exhibition of Recordings of Educational Radio Programs, Miles (90) developed four criteria: (a) appropriateness of the material to radio presentation, (b) relevance of the material to the experiences of listeners, (c) emphasis upon the social aspects of the subject being treated, and (d) stimulus to further activity by the listeners.

In two studies, one of the Damrosch music appreciation programs and the other of thirty educational music broadcasts, Wiebe (155, 156) developed seven criteria specifically applicable to music broadcasts. Bird (133) used fourteen criteria for judging broadcasts used in the classroom and eleven standards for educational broadcasts intended for home use. Howland, Tyler, and Woelfel (124) used three categories in discussing specific standards for children's radio programs: social ideals of American life, personality development of the child, and showmanship or entertainment quality of the program.

Upon the basis of teachers' appraisals of the 1940-1941 "American School of the Air" series, members of the Evaluation of School Broadcasts staff (111, 120, 154) recommended that a school broadcast should be comprehensible to listeners in all grades for which it is intended; that the material be related to the experiences of students; that the content

be organized into a simple and coherent structure; that a consistent pattern of presentation be followed from week to week; that there be comparatively few scenes, episodes, and characters; that sudden shifts in time or place be avoided; that the vocabulary be understandable to classroom listeners; that dialect be used seldom or not at all; that sound effects be used judiciously and sparingly; that voice fading as a transition technic be avoided; that appropriate humorous dialog and situations be used; and that the programs be dramatized.

Kinds of Radio Programs and Their Effectiveness

Lumley (78) classified radio broadcasts into six categories: (a) radio lessons with a radio teacher taking the place of the regular classroom teacher; (b) radio talks; (c) recitations or readings; (d) interviews, debates, and forums; (e) dramatizations; and (f) musical programs with supplementary comments. There is no conclusive evidence concerning the relative effectiveness of these methods, although classroom listeners seem to prefer dramatization. Lohmeyer and Ojemann (72) used three types of presentation (drama, talk, and discussion) with three types of broadcast material (history, science, and literature) and reported that in the acquisition of information the drama and the talk were superior to the discussion, but that in the influence upon attitudes there was no difference between the three methods of presentation. Willis (158) found dramatization most effective and talk least effective. With a group of twelfth-year students, Howell (58) compared a roundtable and a forum presentation; with the roundtable discussion there was a greater gain in information but there was no difference between the opinion changes recorded in the two groups. Using an information test as the criterion, Webster (148) found no difference in the effectiveness of a talk and a drama dealing with historical characters.

As for the rate of speech, Lumley (78) recommended that broadcasts for school children be spoken more slowly than broadcasts for adults (a fact sometimes forgotten by educational broadcasters). Cantril and Allport (19) found that radio talks are more comprehensible and interesting if delivered at relatively low rates of speed, and recommended the following limits:

Theoretical material	110-130 words per minute
Factual exposition	120-140 words per minute
Directions	90-115 words per minute
News	120-140 words per minute
Narrative	120-150 words per minute

Cantril and Allport (19) also reported that talks should be from ten to twenty minutes in length; that specific illustrations aid in the understanding of an idea; that the use of short sentences helps in the presentation of factual material; and that most listeners prefer male announcers to female

announcers. Smith (132) reported that the speed of delivery depends upon the type of listeners and the length of the broadcast.

Who Listens to School Broadcasts?

Only a partial answer can be given to this question. In 1938 Frank Stanton, director of research, Columbia Broadcasting System, made a nationwide survey of school listeners to network broadcasts, but the data have remained in the files of CBS. From a survey in 1940 of 1,160 members of the Departments of Elementary and Secondary-School Principals, Reid (108) reported these data for the "better" schools of the country: CBS broadcasts used in 38 percent of the elementary schools, in 16 percent of the secondary schools; NBC broadcasts used in 34 percent of the elementary schools, in 17 percent of the secondary schools; "Damrosch Music Appreciation Hour" with the largest audience, 6 percent of the elementary teachers and 1 percent of the secondary teachers; all series, even those intended for high-school students, with larger audiences in the elementary than in the secondary schools.

From a comprehensive survey of all schools of Ohio, one of the most advanced states in the educational use of radio, Reid (114) reported these findings: school broadcasts used in 15 percent of Ohio schools, in 8 percent of the rural and 32 percent of the urban schools, in 16 percent of the elementary and 12 percent of the secondary schools, in only 2 percent of the one-room schools; CBS broadcasts used in 7 percent of Ohio schools. NBC broadcasts in 6 percent, "Ohio School of the Air" broadcasts in 6 percent, and local broadcasts in 7 percent of Ohio schools; "Damrosch Music Appreciation Hour" with the largest classroom audience, but no series with an audience greater than 2 percent of Ohio teachers and students; all series, even those planned for secondary-school students, used more often in elementary than in secondary-school classrooms; classroom listening greatest in urban areas close to radio stations, particularly in Akron, Cleveland, Toledo, and Zanesville.

How Teachers Use School Broadcasts

Questionnaire and observation data indicate that teachers ordinarily use school broadcasts as curriculum material supplementary to the course of study. The teachers' manuals and classroom guides prepared to accompany broadcasts seem to be based upon this supplementary nature of radio programs. One interesting exception was that of the CBS "New Horizons" series during 1941-1942. Mr. Adamson (1), the scriptwriter, prepared a textbook, *Land of New World Neighbors*, published by the McGraw-Hill Book Co., to be used in conjunction with the broadcasts. Woelfel and Wiles (162) found that skilled teachers spent some time before the broadcast in checking mechanical arrangements, discussing the subject of the broadcast, and otherwise preparing students for what

they were about to hear; that during the broadcast teachers listened as members of the audience; that half of the teachers encouraged note-taking; that following the broadcast students reviewed the content and discussed the production of the program. Reid (110) reported that the teachers spent approximately an hour a week in using a series of social studies radio programs—eight minutes before the broadcast, thirty minutes listening, and twenty minutes following the broadcast. Woelfel and Robbins (161) reported that all classes in a junior high school listened each Friday to a series of social studies broadcasts, with sufficient time before and after the radio program to allow for discussion. Both the teachers and the investigators believed that the educational values far outweighed the inconveniences of this schoolwide use of radio.

Experimental Comparisons of Radio and Nonradio Learning

By and large, studies of "radio" and "control" groups have been inconclusive, except to show that educational changes can result from radio listening as well as from other classroom procedures. The final report of the Wisconsin studies (8:194) stated: "In general the experimental studies carried on as a part of this investigation yielded decidedly mixed results. The comparisons consistently favored the radio groups only in the field of music, and even here several of the differences were not large enough to be statistically significant." In the acquisition of information, Wiles (157) reported that a group of junior high-school students learned more from listening to a series of news broadcasts than did a comparable group of students who studied current events in the classroom. Miles (88) reported in favor of the radio group. On the other hand, Baker (5), Cook (25), and Mueller (91) found no significant differences in the amount of information acquired by radio and nonradio pupils, and Loder (71) reported results favoring the presentation of material directly rather than through a loud speaker.

With attitudes as with information, the research evidence is inconclusive. Davis and Nichols (32) reported that broadcasts designed to influence attitudes of pupils toward Japanese increased the variability of their beliefs. Lumley (78), Miles (88), Wiles (157), and Reid (110) studied the effects of broadcasts on attitudes, with varying results. Lowdermilk (73, 100) used both recordings and printed versions of the recordings to check the relative effectiveness of listening and reading in influencing pupils' attitudes toward the rights of freedom of speech and of assembly. He found that reading was more effective than listening, but that reading the script while listening to the recording seemed more valuable than reading alone. Of six studies (28, 88, 91, 115, 149, 157) dealing with the effect of school broadcasts upon pupil interests, only one showed a significant increase in interest concurrent with the radio listening. After careful study of these

various "controlled" studies, one must conclude that they add little to educational knowledge or to educational research. In many of them, the hypotheses were not formulated precisely, the experimental factor and other influential factors were not rigidly controlled, the validity and reliability of the experimental criteria were not established, the groups of subjects were not adequately equated, and the statistical technics were not carefully chosen.

Comparisons of Comprehension by Aural and Visual Means

Cohen (23) worked with several hundred public-school children in New York City and found the results of reading versus listening to ten factual stories were inconclusive. Goldstein (47), using groups of adults as subjects, presented in two ways and at seven rates of speed passages from the McCall-Crabbs Standard Test Lessons in Reading. He concluded that listening comprehension was greater than reading comprehension. Goldstein recognized the artificiality of his experimental situation, especially that of reading passages projected upon a screen rather than from a magazine or a book. School children, more habituated to reading, cannot be assumed to learn more easily by ear than by eye. One finding of Goldstein's has important implications for educators, namely, that there is extreme variability in individuals' listening comprehension. Teachers can no more assume that all students listening to a broadcast understand what they hear than they can assume that all students who read a book understand what they read.

Finally, there are Lazarsfeld's insights (68) into the problem, substantiated by numerous research studies conducted under his direction. In general, he found that the lower the cultural level of listeners, the more they listen to the radio; the lower the cultural level of people, the more likely they are to prefer listening to reading; the higher the reading skill of a certain group, the more they prefer to read than to listen to comparable information; and the greater the interest in given subjectmatter, the more strongly will people prefer the medium which gives the fuller treatment. For example, the more interested people were in current events the more they preferred newspapers to radio as a source of news, but the more interested they were in baseball, the more they preferred radio to newspapers as their source. Of the controversy concerning "eye versus ear" learning, Lazarsfeld pointed out that "for every study which shows that the ear is more receptive, another study can be quoted which attributes the same advantage to the eye. The truth seems to be that the physiological means of perception is of itself of only small importance in the communication of ideas; what counts is the situation in which communication occurs—the reading and listening habits of the respondent and the character of the subjectmatter in question" (68, p. 199).

Transcriptions of Radio Programs

One of the phenomenal developments in educational materials during the last few years has been that of records and transcriptions. Commercial organizations, the U. S. Office of Education, and radio stations and radio networks have released transcribed programs and series of programs for classroom consumption. Some of these recorded programs are ten- and twelve-inch records which can be played at a speed of 78 rpm (revolutions per minute) on any phonograph; others are twelve- and sixteen-inch transcriptions which must be played on special machines which turn at a speed of $33\frac{1}{3}$ rpm. As Miles (87) has pointed out, the use of these auditory aids is becoming more and more important in American schools. Many of the studies mentioned in the preceding section have been made with transcriptions of broadcasts rather than "live" broadcasts as the experimental stimulus. Recordings available to schools were surveyed and appraised by Miles (87, 89). Lowdermilk (76) noted that since transcriptions can be played whenever it is most convenient and as many times as educationally necessary, they are superior to "live" broadcasts. The controversy between "live" and "recorded" broadcasts was investigated by Wrightstone (164), who found no differences in the learning effects upon comparable groups of pupils listening to broadcasts and transcriptions of the identical broadcasts.

Radio Workshops and Pupil Broadcasting

From the 1941 survey of Ohio schools, Reid (114) reported that 3 percent of the schools of the state had radio workshops, that most of these workshops were in secondary schools, and that there were approximately forty students in a group. On the other hand, pupils in 13 percent of Ohio schools took part at one time or another during the year in presenting radio programs over local stations—from participating in a band concert to taking part in an amateur contest. From a survey of eighty-nine large Illinois high schools, Purkey (105) reported that half of the schools had presented student broadcasts during 1937-38; that the music, speech, and English departments were principally responsible for preparing and presenting the broadcasts; that the three most important purposes of student broadcasting were (a) giving students experience in radio broadcasting, (b) presenting to others an actual classroom activity, and (c) interpreting school policies to the public. Pupils are often used in the production of local school broadcasts. Walters (146) described the process followed by sixth-grade children and teachers in the preparation of 24 fifteen-minute news programs. Scripts available for high-school broadcasting were analyzed by Byers (18) and evaluated upon ten criteria.

Various aspects of the production and presentation of radio programs have been analyzed in master's theses: newscasts by Edmonson (34), radio

plays by Buss (17), and voice training by Hale (50). Of more importance to one interested in technics, however, are the books on script writing and radio production written by experienced radio broadcasters, particularly those by Carlile (20), McGill (79), and Wylie (168). As for the requirements necessary for radio personnel, Levenson's investigation (70) is the most exhaustive in the field.

Radio Courses and Units in Public Schools

In 1941, approximately 15 percent of Ohio schools had radio units or courses, most of them in the fields of science and mathematics (114). One of the unique curriculum developments in radio has been that of the tenth-grade English course of study (121) in Rochester, New York. The literature, speech, and composition activities of the second-semester course are focused upon radio. With the cooperation of Rochester teachers, Reid (113) made an evaluation of the course. Stenius (135) described an experimental course in radio offered in Detroit Western High School. In master's theses, Blecker (14) and Foltz (44) discussed some of the possibilities of using radio in the classroom. Power (104) described a course in radio speech included in the high-school curriculum of Texas. Of interest to curriculum constructors are: an analysis of occupations in radio by Bartlett and Miller (11), an investigation of the objectives and content of radio speech courses by Lawton (67), and an analysis of the training and characteristics desirable in radio personnel by Levenson (70).

Curriculum Use of Out-of-School Broadcasts

A 1941 survey of Ohio schools (114) indicated that in 78 percent of the schools one or more teachers gave some attention to pupils' out-of-school radio listening, principally through occasional recommendations to listen to specific programs. In only 4 percent of the schools were there teachers who assigned radio listening, thus placing the activity upon an equal footing academically with that of out-of-school assigned reading. Reid (113) described some of the ways in which Rochester, New York, teachers made use of evening radio broadcasts. Lowdermilk (76) made an interesting study of the curriculum use of "America's Town Meeting of the Air" broadcasts. High-school students in thirty-two classes throughout the country listened to the programs at home, then spent the following day discussing the issues in class.

Radio program discrimination—Radio has grown so rapidly that few educators have seriously considered their responsibilities in developing discrimination in radio listeners. Tyler (142) presented the case for teaching radio discrimination and suggested that it probably belonged in the English area. The possibility of teaching discrimination has been studied, with varying results, by Merrill (85), Goudy (49), Heskett (55), and Robbins (118).

Conclusion

Such has been the research of the past few years dealing with radio in the schools and classrooms of the United States. Despite the mediocre quality of some of the studies, despite the insignificance of some of the findings, despite the lack of coordination between investigators and between investigations, a synthesis of the field permits four generalizations: (a) that there are on the air today many broadcasts highly enjoyable and educationally valuable to pupils and teachers alike; (b) that comparatively few teachers use this curriculum resource made available through technological progress; (c) that radio broadcasts, like motion pictures, books, magazines, and other teaching aids, can be used effectively in the achievement of educational objectives; and (d) that the possibilities of radio—as a medium of communication, as an agency of education, as a form of art and literature—have only been touched as yet in the public schools.

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CHAPTER VII

The Library in Education

HELEN L. BUTLER

RESearch in librarianship is a recent development. Until perhaps fifteen or twenty years ago library investigation consisted largely of enumerative bibliographies and small-scale service studies of local institutions. Since that time, however, the output has increased from a small trickle to a fair-sized stream marked by clarity and force. Whole areas still remain untouched by investigation, but where work has been attempted a scientific beginning at least has resulted.

Research in Librarianship: Bibliographies

Bibliographies of research necessarily remain limited. Waples (82) listed the theses of students in the graduate library schools of the nation. Witmer (93) extended the source by drawing off dissertations embodying the work of both education- and library-school students, but limited the area to studies of the secondary-school library. Heaps (30) supplemented her list for the years 1936-39. Carnovsky (12) restricted his choice to thirty-five works he considered progress-making and definitive. No bibliography is known to the present writer which cuts across elementary-, secondary-, college-, and public-library fields, in terms of education. No institution or agency has yet undertaken the systematic collection or abstracting of published and unpublished studies in the library field.

Philosophy and Objectives of the Library in Education

Two articles by Wilson (94, 95) called attention to the direction library service should take in college and university and to the essential factors which make for productive relations between students, faculty, and books. Branscomb (10), after a year's study at the request of the Association of American Colleges, emphasized educational effectiveness and urged that libraries be encouraged to develop plans in which the book collection might emerge as an instructional tool of first importance.

On the secondary level, Ditzion (20, 21) related the origin and development of school libraries to the work and philosophy of such leaders as Dix, Torrey, Mann, and Bernard, and paralleled library progress with educational advancement. In New Jersey (62) librarians from 165 junior and senior high schools recorded their opinions concerning the role of the library as a school activity. Most important, in the order named, were (a) teaching the use of books and libraries, (b) directing pupil leisure reading, (c) assisting instruction, (d) adjusting library service to chang-

ing class content, and (e) establishing an atmosphere of democratic co-operation. In actual practice they acknowledged the first of these to be last. The most succinct expression of the philosophy of the school library is found in the brief preliminary statement of the circular issued by the American Association of School Administrators in conjunction with the Research Division of the NEA (3). Here the library was conceived to be at once a service agency, teaching agency, book center, and reading center.

Evaluation of Library Service

Early attempts at evaluation by state departments, accrediting bodies, and local school authorities resulted, according to Spain (76), in quantitative measurements of book stock, seating capacity, and other enumerative items, which not only failed in their purpose but eventually stultified library growth. In 1936, accordingly, Waples (88) published at the request of the North Central Association his basis for the determination of qualitative standards for the college library. He recommended four devices: (a) an information schedule showing funds, methods, and policies of book collection; (b) a checklist of general reference books; (c) a checklist of periodicals; and (d) a reading record for each student and faculty member. A year later there began to appear in print some of the preliminary findings of the Cooperative Study of Secondary School Standards. From these and other data were evolved criteria (16) for evaluating the high-school library in terms of the philosophy of the school of which it is a part, of the nature of the pupils it serves, and of the community in which it is set. The rating included eight phases (Schedule F): library staff, organization and administration, book stock, magazines and special materials, book selection policy, teacher and pupil use, service policy, and adjustment to the objectives of its own school. This is the fullest and most satisfactory set of criteria yet worked out, and should prove a means of estimating not only the relative standing of a given library but also its improvement and growth over a period of years.

Library Surveys

Joeckel (35) reported to the Advisory Committee on Education on library service of all types including, briefly, public libraries, school, college, and university libraries, and, more fully, federal library service. Many of his deductions were based on conditions cited in Wilson's earlier work (92) which had pointed out the percentages of population which received library service in the states; the small number of counties which had complete public library service, and the large number (40 percent) which had none; and the location of the 45,000,000 citizens who had no access to libraries of any kind. An early publication of the U. S. Office of Education (36) presented Johnson's examination of the staff, administration, and facilities of 390 secondary-school libraries. Of the schools

described, sixty-seven had no seating capacity whatever for their pupils and thirteen used no classification system for their books.

Excellent surveys of school-library conditions have been made in two states. From information reported by the schools, California (11) evaluated approximately five hundred public-school libraries. The data permitted comparisons to be drawn on many points with conditions in other states. The Regents' Inquiry of New York State centered attention chiefly on the contribution made to the reading program of the state. Thus Waples and Carnovsky (87) found that in two superior communities the quality of high-school students' reading was better than that of their parents and approached that of their teachers; that the library's educational value had a positive relationship to funds available; that the richest returns came when school and public library cooperate; and that the existing method of distributing state aid to public libraries needed revision. Smith (73) found that elementary-school pupils of New York State were somewhat below national norms in knowledge of literature; that teachers were book conscious but limited in book knowledge and book sources; and that some of the smaller communities most poorly supplied failed to take advantage of the state traveling library.

Cooperation between Library Systems

Attempts have been made in some regions to rectify the substandard conditions resulting from inadequate financial support and lack of administrative vision by resorting to state aid and state supervision of school libraries. Permissive and mandatory legislation in this respect has been collected and analyzed by Lathrop (44). The effects of such supervision upon growth and organization have been studied by Gaver (28), Wofford (100), Barbor (6), and Hoyle (32) for certain southern states; by Churchill (15) for Illinois; by Lane (43) for New Jersey; and by Skaar (72) for Wisconsin.

Investigators have deprecated the overlapping of function and service between public- and school-library systems and have made various proposals intended to spread books more widely and with greater economy than now exists. Joeckel (35), for example, called attention to the competitive aspect of respective services. The Educational Policies Commission (60) proposed the ultimate unification of all educational activities (including public libraries) within each community under the public education authority and, until this could be brought about, suggested contractual agreements between public and school libraries. Cecil and Heaps (14) analyzed carefully various participatory schemes of service in state, county, regional, and local cooperative units, and described costs and activities in sixty-seven cities where such cooperation is in effect. They recommended full responsibility for library service by the schoolboard, accompanied by cooperation with other library agencies at all times.

So, too, a Joint Committee of the NEA and the ALA (61), evidently fearful of the loss which too-sweeping changes in school-library policy might entail, was emphatic in its declaration that the place for a school library is in the school. From practices reported in thirty-five selected communities, the Committee presented a detailed account of the activities and procedures which illustrate acceptable working relationships between school and public library. School administrators may find help in the comparative figures published by the American Association of School Administrators (3).

Library Organization and Management

Research in the field of internal management is progressing rapidly. In 1932 Allez (1) made a time-study of the activities of librarians in eight Wisconsin teachers colleges, noting the number of hours per week professional and clerical staff members said they spent on administrative, technical, routine, clerical, service, and "professional" activities. The findings were somewhat weakened by the fact that there was little agreement in definition of terms. Crookston (17) found the direct labor costs of services for 542 professional, clerical, and student staff members in eleven high-school libraries which ranked high by the standards of the Cooperative Study of Secondary School Standards. She computed the unit costs of reference, teaching, advisory, circulating, cataloging, and other services. The mean cost of acquiring a book in ten libraries was found to be 2.6 minutes, or 31 cents; circulating the volume required the same time but only 2 cents. Most expensive of the library's tasks was the preparation of a bibliography which took 98 minutes and cost \$1.59. Other studies in internal management include (a) the formula worked out by Axe (5) for making book-fund apportionments in Los Angeles schools based on the average cost per book in high schools, and upon the average use per pupil-period in the social studies; (b) the cost of acquiring and cataloging a college book collection investigated by Miller (55); (c) the efficiency of separate library rooms versus the study-hall combination in Louisiana by Robert (69); (d) steps in the organization of centralized library service for New York rural schools by Rimkus (68); and (e) comparison of the professional and academic training received by secondary-school teachers and by librarians by Alstetter (2).

Adequacy of the Book Collection

The field most commonly investigated is that of the book collection, to determine quantity and quality, and/or to ascertain its use by the library's clientele. Customary procedures consist of checking the number and distribution of the titles against subject fields covered, inclusion on accepted lists, date of publication, and size of classes or enrolment. In elementary schools, grade placement also is often considered. Most

complete in data collected was the Missouri study (101) made for the Committee of the Cooperative Study of Secondary School Standards, which obtained figures for the number of titles, of duplicate copies, of social science and natural science works published within ten years, of magazines subscribed for from a recommended and weighted list, and of the supplementary materials such as slides, films, pamphlets, and records. California (11) reported by level of school and size of enrolment the frequencies of possession of standard reference works, of recommended magazines, of professional books for the librarians' use, of newspaper subscriptions, and the percentage of books in each major classification. On the university level, Raney (65) checked some four hundred subject bibliographies against the holdings of the University of Chicago libraries and formulated his acquisition policy and needs upon the weaknesses so revealed. Bariani (7) took into consideration not only the book-spread according to publication date and subject distribution but ascertained curriculum strength by relating the titles to those in authoritative bibliographies, to course assignments and needs in her school, and to availability elsewhere on campus. These studies may be contrasted with that of the Bibliographical Planning Committee of the University of Pennsylvania (9) which, proceeding on the conviction that the adequacy of a collection is best judged by the faculty who use it, inspected the University's libraries department by department and shelf by shelf, and found the results good. A contrast is also found in the methods employed by Westervelt (89) who cumulated from various sources a standard juvenile book collection for New York normal schools. Martin (53) synthesized the findings of seven studies of periodicals, consulted widely, and prepared a descriptive list of one hundred selected periodicals for high-school use.

Reading and Library Use

Probably no phase of the library in education has received so much attention or ranged so widely from scientific observation to incautious generalization as has library use. Reports vary from citation of total circulation figures to detailed distributions assigned to factors believed causal or relative. Most of the studies in children's reading tie back in one way or another to Terman's early study (79), and demonstrate the soundness of his deductions on the influence of intelligence, age, and sex on juvenile reading. Lazar (46), investigating the reading interests of 2,027 New York City pupils, found that the bright pupils read more than the average or dull; that girls read more books than boys; and that while the girls who read boys' books were usually bright pupils, the boys mentioning girls' books were dull. Availability of suitable reading materials was stressed by Stribley (78) who inspected nineteen rural schools in an Iowa county. The appalling conditions brought out in his analysis of the collections were reflected in the pupils' reading, only 6 percent of which was on a standard list and 14 percent of which consisted of "Big-Little

Books." A correlation coefficient of $+.72$ between total books read and number of books read from the school library was thought significant evidence that the children were reading what was at hand. In 1930 Lewerenz (47) found that the higher the IQ level of Los Angeles schools, the greater the representation among public library users.

The effect that skilful instruction and a free-reading program may have in improving reading habits was demonstrated by La Brant and Heller (41), who through individual suggestions and formal class discussion were able to extend both the quantity and quality of reading done by two groups of students in the Ohio State University School over a period of three years. The writers reported marked sex differences. From records for 112 pupils, varying from one to six years, in the Bronxville, New York, high school, Eberhart (23) concluded that the seventh grade is the period of widest reading, but that, although reading in senior high school is less voluminous, the proportion of nonfiction read is almost four times as great, and the fiction reading is more mature. The negative results obtained when guidance is lacking are implied in the study by Lawshe (45) who found that pupils read no more after free reading had been introduced than when reading was prescribed; that marked decreases in biography and travel had occurred; and that fiction, some of inferior quality, had increased.

The problem of the nonreader has long interested librarians. Linderman (48) studied sixty-five nonusers of the high-school library and found that they came largely from nonreading homes; they had not been read to or otherwise stimulated to read when small children; they belonged to no out-of-school clubs and took less interest in the school's extracurriculum activities than did their classmates. Though their average IQ was only 3.4 points lower than the average for the school, 45 percent of this group was receiving failing grades. As a partial explanation of differences observed in reading habits, Moreland (57), Zeller (102), and Thorndike (81) attempted to determine basic interest patterns rather than actual reading preferences. After examining the responses of 2,891 bright, average, and dull pupils to 88 annotated fictitious titles, Thorndike concluded that sex is the most important determinant of interest, and that within the same sex bright children are most like slow children who are two to three years older. His findings should interest teachers and librarians responsible for reading-guidance programs.

Waples and others (86) synthesized the literature on social effects of reading and enumerated motives which send people to books, described the values they find in them, and hypothesized the effect that books share with personality in modifying social behavior.

An overview of college and university library use may be obtained from the articles by White (90) and Smith (74). Much additional information is available in general college surveys and in the report of the evaluation study by Waples (88). Many of these are ably summarized by Branscomb

(10). Results are not always comparable due to variations in local record-keeping and in open-shelf policies. Among more recent studies may be cited those by Thompson and Nicholson (80) and by Stieg (77) whose findings largely confirm earlier investigations in respect to mean circulation per student and subject fields most in demand. Engleman (25) rejected reserved books from her consideration in an attempt to discover the responsibility for and success of the general reading program in seventy-nine liberal arts colleges. She showed that general reading, as contrasted with reserves, had increased slightly over a five-year period; that less than one-fourth of the institutions had studied their students' reading intensively, and only seven had applied the results to their book-selection policy. Lancaster (42) found little correspondence between actual library use and the amount of instruction given.

Teaching the Use of Books and Libraries

Instruction in books and libraries is postulated in every statement of objectives for library service, on all levels. The general surveys show that most libraries make some provision for such instruction, either informally by lectures and tours during orientation week or in formal courses both with and without academic credit attached. Many textbooks and manuals have been written for such instruction but of actual research there is little. Two studies are outstanding. Reed (66) constructed a test on three levels—elementary, secondary, and college—and carefully checked it for comprehensiveness, validity, and reliability. She found that the three levels made clean-cut distinctions with 3,345 students in fourteen institutions. Dear (19) administered the Peabody Library Information Test (71) to 1,322 college students in nine colleges under classroom conditions and found it capable of discriminating between classes of different levels and between classes of the same level in different colleges. Using the elementary-school form of this test, Moore (56) found a satisfactory correlation between library skills and educational age, mental age, and achievement for 130 children but found no definite relationship with general reading performance as shown by the number of books they read. Probably no phase of the library-in-the-school needs further light shed on it than this one.

The Library and Adult Education

None of the foregoing researches pertain directly to the library in out-of-school, or leisure, education, but many of them include data which could be drawn off for the purpose (35, 86, 92). There are other studies of public library use in particular communities (cf. 12, 29, 39, 67, 84) which determine the percentage of population using or not using the library; the number of books borrowed; the education, sex, and occupation of the borrowers; and the subjects and quality of the materials bor-

rowed. Unfortunately, the records also include books circulated to students in neighboring schools. Morriss (58), however, limited her observations to a small group of adults whose elementary-school education had been neglected. She advanced certain book-selection criteria and a short list of books meeting these standards. Egan (24) investigated the reading of young men enrolled in CCC camps and reported good results from personal advisory service. Flexner and Hopkins (26) analyzed the records of 1,250 persons, or 20 percent of the total number, who had asked help of the readers' adviser in the New York Public Library. The purpose, subjects, and extent of their reading were related to sex, education, age, and occupation. General statements of opinion on adult reading are expressed in the papers edited by Wilson (93) and in the more comprehensive list of works compiled by Beals and Brody (8).

Some Areas for Further Research

Many gaps in our knowledge of the part played by the library in education call for further study. We should like to know more about the elementary-school library: what its particular functions and performance under optimum conditions are, as distinguished from those of the secondary-school library; how to evaluate it in its own setting; the efficiency of the teacher-librarian in contrast with the full-time librarian, and the point of diminishing returns for each. High-school principals and librarians would welcome convincing proof of the effectiveness of the study-hall combination over the separate library room, and the circumstances under which this is true. For libraries of all levels information is needed on the relation of library costs to those of other units, that is. subject fields, laboratory subjects, gymnasium and health programs, and all special curriculum fields. Especially do we need more light on the nonreader, on his characteristics and whatever might explain the fact that the student who reads widely tends also to stand high in his classes. For the community at large, evidence must be secured of the most satisfactory means of utilizing the library resources of the region economically.

Meanwhile it is interesting to observe that the direction which the administration of this educational instrument should take is still under question. For many years institutional libraries followed the pattern set by the public library as a more or less independent and self-contained unit. More recently school and college libraries have proceeded on the theory that the library is not an entity in itself but an integral part of the school it serves. Because many school systems are unable to provide libraries of the caliber now considered essential, educators look to cooperation between all library agencies in a community. As has been seen, a few pioneers favor the administration of all libraries by the educational authority. The very proposal is indicative of the boldness with which current research is challenging long-accepted traditions and modes of library procedure.

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CHAPTER VIII

Visual Aids in Education

JAMES S. KINDER

IN SPITE OF THE FACT that this is the first systematic presentation of visual literature for the REVIEW, it is not possible to do more than sketch in briefest form the history of the development of this field. Emphasis is reserved for the more significant researches of the last three years. Visual education is one of the most rapidly developing aspects of teaching. The term is used to identify representational and experiential materials and technics, which in one way or another are used in every effective school to clarify and intensify the learner's mental images of the object, process, or event being studied. Visual aids have been used by classroom teachers for generations; some forms, however, are relatively new.

The present review is too restricted in scope to classify all the researches done in this field, because these aids include such media as blackboards; bulletin boards; cameras; cartoons; demonstrations; excursions or field trips; films (silent and sound); filmstrips; graphs, charts, and diagrams; illustrations; maps and globes; microslides and microphotographs; models, specimens, and representations; museum materials; opaque projection; slides; and stereographs. In the literature for this field, one finds the terms "audio-visual" and "visual-sensory" as often as the term "visual" alone. To avoid what appears to some educators as a confusion of terms, Hollinger (33) suggested that the designation "perceptual aids to learning" be substituted. Thomas (67) used the same terminology. Hollinger stressed the need for emphasis on the meaning, place, and importance of the "percept" in all learning.

Two decades ago research in visual education centered around the studies of Freeman and his colleagues, Weber, Sumstine, and others. At that time research in this field was rare. Today the literature is replete with discussion articles, surveys, and careful experimental researches. *The Educational Screen* is a journal "devoted exclusively to the visual area in education." *The Visual Review* published annually presents a general summary and survey of visual development. *Scholastic*, a national weekly designed chiefly for secondary schools, devotes one section to audio-visual news. Such magazines as *The Journal of Educational Sociology* and *Education* devote one or more issues each year exclusively to this area. Practically all the educational journals carry numerous articles from time to time on visual education. Many other articles appear in the journals of the various state education associations. Textbooks, pamphlets, conference proceedings, and news letters increase the volume of material.

Many school experiences are sterile and barren. Purely vicarious and verbalistic learning of facts is not consistent with modern theories of

education. Even after years of hard study the learner is somewhat like the contemporary of Emily Dickinson, of whom she wrote, "He has all the facts but not the phosphorescence of learning." The motion picture, particularly the sound motion picture, has brought a resurgence of interest in visual aids to a field that previously was rather drab and undifferentiated. The motion picture and the radio have proved to be exceptionally effective adjuncts to teaching. They give vivid and lasting impressions; detailed concepts; broad, interesting, and stimulating experiences; and variety. Half a score of years ago educators were asking, "Why visual aids?" Today the question is, "How can we use visual aids most effectively?"

Technics in Using Visual Aids

Visual education is not a subject nor is it a distinct method such as the project method, the socialized recitation, the unit plan, or the lecture-demonstration. It is a procedure which deals with visual materials. It is, therefore, supplementary to other methods much as the library and laboratory are supplementary. All these procedures, however, have their own technics for optimum results.

Lake (40) maintained that motion pictures should be previewed by the teacher before they are used in a learning unit; film ideas should be adjusted to the purpose of the lesson; there should be specific preparation of the class to receive the film; before and after the film showing there should be time allowed for related class activity; and there should be a definite "check-up" of the ideas which the pupils got from the film. Dickter (19), as a result of extended experience with visual aids at the junior high-school level, agreed with Lake, but added that teachers and pupils should use an evaluation form of some kind for purpose of future record. Dickter listed errors, or "don'ts," for the teacher as follows: (a) showing two or more unrelated films during the same period, (b) failing to have pupils know specifically the purpose of the film, (c) asking very general questions to start the discussion after a film showing, (d) showing the film at the wrong time, (e) failing to use the film a sufficient number of times, (f) reading extensively to the pupils from the teacher's manual which accompanies the film, (g) using films not sufficiently related to the unit under study, and (h) using a film when some other aid would have served better.

In a carefully controlled experiment with eight hundred eighth- and ninth-grade science students, Krasker (39) got at the heart of many troublesome problems of film usage. He found that size of class affects the learning even though films are used. (Small classes—exact size not stated—were better than large classes. Doubtless, much of this was due to the fact that better learning attitudes prevail in smaller classes.) Preparation for showing the film is essential. Classes should not be marched off to the auditorium for the film showing. The Michigan yearbook (48) stressed much the same points.

No instance of scientific research has come to the present reviewer's attention which has shown a loss in amount of learning by pupils when taught through the use of visual media. Stadtlander (66), Hansen (25), Kirkpatrick (38), Wise (76), Lamoreaux (41), Krasker (39), Bradley (10), Reitze (57), and others showed definitely that visual aids are a distinct asset to effective teaching. Also, researches show that this statement holds for all, or practically all, curriculum subjects. A few representative studies here are: in English—Ginsburg (23), Spilde (65), Holland and Netterville (32), Hart (27); in nature study and geography—Stadtlander (66), Peters (53), Repass (58), McLeese (45); in history and social studies—Wise (76), Eichel (21), Walters and Noel (71), Bradley (10); in reading—Winchell (74) emphasized the value of the flashmeter and other types of visual aids, and Berg (8) achieved excellent results with retarded readers with the use of the filmstrip; in science—McCowen (44), Maneval (46), Molyneaux (50), Bennett (7).

Other Uses of Visual Aids

Most of the foregoing studies dealt with factual learning of the classroom type. Ramseyer (54) investigated the effect of the documentary film on social attitudes. Using students from the sixth grade through college and noncollege adults, he showed changed attitudes produced by motion pictures. Social awareness can be materially stepped-up. Furthermore, the changes wrought prevail after a period of two months.

Appreciation—Educators and critics have been concerned over what appears to be a low caste motion picture appreciation. Efforts are now being made in the schools to cultivate a high type of appreciation and a body of critical-minded theater-goers. Dale's work (15) has been significant in this area. Scores of classroom teachers and principals, among them Williams (72), Allensworth (2), and Smith (63), have produced fine results. Motion picture and photoplay appreciation clubs and classes are numerous.

Picture production—Recently many schools have produced scenarios and motion pictures. In some cases this is merely activity of a spectacular type designed to impress the parents, taxpayers, or professional colleagues. In other cases, however, the making of films has a real purpose. It stimulates creative pupil activity and creates worthwhile learning situations. Hart and Wenger (29) stressed the fact that education which does not result in doing or acting is of little value. Health and safety rules must be translated into action. The Denver schools made a notable contribution to school-made films. Livermon (42) showed conclusively that much originality in acting, writing, designing, and directing is provided by school-produced films.

Public relations—Administrators see in visual aids not only valuable educational tools but also implements for the cultivation of better public

relations. Here is an effective way of "selling" the school, or ever increasing budgets, to the taxpayers. Martin (47) feels that the motion picture is a modern, dignified, and impressive way of letting the public know what the school is doing. Wagner (70) made a careful survey study of the school-made film for public relations in Ohio. Thirty-eight districts in Ohio had used such a procedure, filming such topics as a typical day in the school, football, safety, May Day, teacher selection, community aspects, and public service. He showed that the school-made film has more audience drawing power than other school-community meetings. Some schools reported that attendance at such meetings in their districts had doubled. Comments and reactions of the school patrons were highly complimentary, hence Wagner concluded that school-made films "should be a part of every balanced and continuous public relations program."

Equipment

Numerous short articles dealing with equipment or surveying the equipment now found in schools have appeared from time to time. One significant reference has appeared over the last three years. The Society of Motion Picture Engineers in 1941 published a report of its Committee on Non-Theatrical Equipment (64), which is a most reliable and usable study. The Society gave pertinent suggestions concerning technical specifications, defining performance of 16-mm. projectors, and the typical characteristics of various types of screens.

School Journey

School journeys, excursions, or field trips are old technics in the teacher's repertoire. In the last decade they seem to have taken on new meaning. The Pennsylvania State Department of Public Instruction contributed materially to their development through the publication of two pamphlets (51, 52). A bulletin of the elementary principals of Los Angeles (43) provided further emphasis. The trips of Lincoln School, Teachers College, Columbia University, have been given much publicity. One of these trips (to the coal fields of West Virginia) was described by Baker (5) and an evaluation and appraisal made by Rath (55). About a year later, thirteen high-school students of Morgantown, West Virginia, made a ten-day trip to New York. Jones (36) provided an excellent evaluation of this field-study experience, showing changes in thought-pattern of the individual students. One high-school principal (59) apparently takes his high-school students on a ten- to twelve-day junket each year covering some three thousand miles or so. This principal is also looking forward to a not too far distant day when his school will offer credit toward graduation for field trips. Selke (61) has not only emphasized the values of trips but has given concern to the standards for judging field trips. The most pretentious and reliable study yet reported in this area was made by Atyeo (4).

Other Visual Media

Although the motion picture is the predominant aid in the visual field, each of the other aids has a specific part to play. No one tool will serve all the educational purposes served by visual education as a whole. Each aid has a more or less specific function. Slides and motion pictures are exceedingly valuable in teaching geography, but Waddle (69) also found the stereograph to be a useful tool in geography teaching.

Science teachers have achieved excellent results with the microscopic projection and microphotographic slide. For purposes of projecting live specimens and bringing interest and reality to the class, these media can scarcely be equalled (73). Breechbill (11), using controlled groups in an elaborate experiment at the University of Maryland, found that experimental groups of science students taught by use of microprojectors showed more uniform learning than control groups with an individual microscope for each pupil. Other results were: in general the pupils seem to prefer the microprojector method; beginning students appear to profit more than advanced students. The results of such an experiment should mean considerable savings in dollars and cents for science equipment. Hall (24) investigated the preferences of 345 high-school students in science for three basic types of illustrations—diagrams, cartoons, and photographs. He concluded that (a) age makes considerable difference in the preferences, (b) high-school seniors prefer diagrams, (c) ninth- and tenth-graders prefer cartoons, and (d) photographs are low in the preference of all groups. Somewhat along this same line, researches in recent years have shown that maps, graphs, and charts as well as pictures need to be taught.

Carthew (13) emphasized teaching such timely maps as are found in newspapers, magazines, almanacs, and the automobile road map. Cobb (14) showed how these are to be used. Wise (75), using controlled technics, showed that, with sixth-graders at least, special training in map reading and study gave greater improvement than incidental methods, and Wrightstone (77) found a gradual growth in map and graph reading ability from the seventh through the twelfth grades.

Abramson (1), Berg (8), and Earley (20) reminded us that the opaque projector, the filmstrip, and the museum still have their contributions to make. Miller (49) has substantiated the findings of earlier investigators in the matter of what children see or do not see in a picture. Children seem to miss many items in nearly every picture, and frequently the items are seen in isolation rather than as parts of a unified whole.

One of the intriguing facts that has grown out of visual education studies is that most visual aids can be used over a much wider scope of grade placements than verbal materials. Using a sound motion picture, Sherman (62) showed that even first-grade children, some of whom had not previously seen a squirrel, learned the concepts of gnawing, balancing, running, climbing, and sniffing the air better than through any other medium.

Rummel (60), using 2,100 children, Grades III through XII, concluded that films have a larger grade area than has been supposed. Stadlander (66) came to the same conclusion.

Next Steps

The foregoing review is representative of the research and literature in visual education. The field has grown rapidly in recent years. Kinder (37) found that research is being carried on in nearly all the leading institutions of higher learning in some aspect of visual education. Many of these researches are being done in connection with the master's degree, but more and more doctoral work is in evidence. Research divides nearly evenly into administrative and technic problems. Certainly the need for research into unit studies and grade level adaptations has not progressed far. Likewise, such areas as artistic and esthetic judgments, attitudes, and learning processes await much fuller treatment and development. Bean (6) believes that we are on the verge of new and important developments. Hansen (26) and Reed (56) have outlined a fruitful field for investigation. It should also be pointed out that there are many studies, perhaps some of them of restricted range, which need to be done by the teachers in the classroom. These studies, though small in themselves, build the backlog of knowledge for the use of visual aids. This is as necessary as the larger foundation studies.

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CHAPTER IX

Educational Psychology

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DURING THE PAST THREE YEARS investigations in the field of educational psychology were reported under various headings in issues of the REVIEW and elsewhere: teacher personnel, pupil personnel, mental hygiene, exceptional children (35)—perhaps the most significant work in this area being the delineation of endogenous and exogenous feeble-mindedness by Strauss and Werner (84)—growth and development (61), and intelligence (62). During this period the IQ controversy (94) ran rampant with a flutter of varicolored banderillas in its neck defying anyone to administer the *coup de grâce* until the public realized it was witnessing not a struggle in the arena but a tempest in a teacup. Surveys in the REVIEW have likewise appeared, or will appear shortly, on appraisal and on the psychological aspects of the school subjects, where the most prolific work has been in reading (96), though the increase was noteworthy in psychological investigations in the esthetic aspects of learning, particularly in music (79) and in design (100). In this chapter some of the more significant studies in educational psychology are reported following those of the June 1939 issue of the REVIEW, but excluding the areas indicated above. Hence the material treated will relate to the whole school situation rather than to specific school subjects or activities.

The Thought Processes

Conditioning, which came as an answer to the behaviorists' subvocal tensions, has been shown by Hilgard and Marquis (36) and others to be a more complex process than the classical Russian experimentation originally implied. Responses conditioned by different perceptual configurations suggest Gestalt organization (71) and raise the question of equivalence of stimulus patterns (72) that is discussed at length by Hull (39).

Studies of transfer during the preceding six years were reported by Orata (64) who discounts "identity" and favors the more familiar explanatory phrases, "generalization" and the "reconstruction of experience." A so-called generalization method in arithmetic (90), which "emphasized the discovery and use of relationships existing among addition combinations," proved more effective than a drill method in which each combination was "a specific element with no relation to any of the other number facts." The various interpretations that can be given to generalization make it a convenient explanatory principle; but its scientific value, since its famous though elusive launching on the waters of the dart-throwing experiment, is now called into question. An effort to repeat the experi-

ment (33) eventuated in results somewhat less favorable to generalized experience, as such, than those credited to the original reports. Katona (47) emphasized the importance of understanding as contrasted with uncomprehending drill, memorizing, and training, and Brownell (17) showed that the use of a visual "crutch" in subtraction not only did not prove to be a handicap but facilitated the learning of both bright and slow pupils.

The concept of set is apparently due for a revival since Dashiell called attention to it as a neglected fourth dimension in psychology. Though it is variously defined and often ambiguously used (29), it turns up in configural conditioning experiments (70), and in investigations of the law of effect, in one of which (99) the effect did not operate when the "learning motive" was not present, in an experiment that was disguised as one in extra-sensory perception.

In one learning study (48) the value of supervision was tested when teacher effectiveness was equated on the basis of pupil performance and reliable differences were found in subsequent pupil improvement in favor of a supervised over an unsupervised group. In another (73), the dangers of standardized testing were pointed out when high-school pupils, after a six weeks' introduction to chemistry and twenty days of intensive drill on factual material, scored better on the cooperative test than pupils who had spent a year on the subject. A series of studies by Rubin-Rabson (75), in the psychology of memorizing piano music, found little difference in the effectiveness of different methods except for the apparent value of prestudy periods. Stroud (85) reviewed the literature on learning in school situations emphasizing those studies which test out the results of laboratory investigations. The theoretical contribution of the year was Hull's "mathematico-deductive study of rote learning" (40).

Razran (69) concluded that verbal conditioning is primarily semantic, that is, that verbal stimuli can be equivalent because of their meaning-content factor. Maier (59) postulated three psychological processes to account for the various ways in which problems are solved: variability, for trial-and-error; equivalence reactions including transfer of training, for that form of concept formation in which some limited aspect of a situation comes to evoke the response; and spontaneous integration or "reasoning," which differs basically from the other two. Herrick (34) concluded that inductive problem-solving is good when it is characterized by the abandonment of wrong hypotheses before they have received a fully logical disproof and by a variety of hypotheses. Persistence in following out one hypothesis bears an inverse relation to the number of alternative possibilities (74).

Influence of the Social Environment

While hereditary influences have a determining influence as shown by studies of identical twins reared apart and of foster children (101), the structure of the social environment is recognized as of tremendous

significance in the modification of human personality. Chaotic as is the field of social psychology (46), educational psychology can definitely profit from a better understanding of its data and technics. The most original work, many would agree, is that being done by Lewin (52) who has been employing topology as a geometry to represent behavior as a totality of co-existing facts having the character of a dynamic field. Following the field theory, Lippitt (55), using two children's clubs in which the effects of autocratic and democratic leadership methods were differentiated, was able to clarify many socio-psychological phenomena familiar in the school society. That experimentally-minded teachers may not confuse autocracy with petulant domination and democracy with inefficient *laissez faire*, Pistor (67) has designed a rating blank listing 120 classroom practices that can be used to aid in preparing pupils to participate in a democratic society.

The methods, results, and problems of social research, not only as they affect the school but the wider society as well, have been summarized under the authorship of several leading workers in the field (10). The time sampling technic was effectively employed by Arrington (7), particularly for the study of continuities in children's verbal behavior.

The wider social environment has begun to attract the attention of educational psychologists. E. L. Thorndike's compendious volume (92) and other studies (83, 91, 93) emphasize the continuity of the adjustment process in which the school participates. How important the human social order is in determining the course of development was suggested by way of contrast in the reports on feral children (104) in which it is absent. The objectives sought and means chosen for obtaining the desired ends differ in different cultures. The duty of education in Fascist Germany (38) is to foster adolescent ecstasy; to be Hitler's soldier raises youth to supraindividual exaltation and action and suprahuman, intoxicating conquests. A report (97) of a comparison of the work of the Bremen Institute for Youth Study for 1926-28 and 1939-40 reveals that as a result of the application of principles received from the Führer, the later fourteen-year-old group is better physically, their characters are firmer, they need stricter discipline, but their scholastic showing is not so good.

On the basis of several studies, Furfey (28) pointed out that undesirable culture traits are not changed by attention to the individual alone, but to the area, class, or group. Koshuk (50) reviewed 525 studies, made since 1925, of socio-cultural influences affecting the behavior of young children, indicating research trends; and J. E. Anderson (5) classified the results of typical studies and enumerated the chief factors conditioning social behavior, for example, selective social learning, social experience provided by the environment, equipment, and out-of-school social participation. The teacher's record of socialization within the community as described by Greenhow (31) is not an enviable one.

The school population is definitely influenced by the wider society and also by the home environment (57); and more effective procedures can be employed (30) in modifying the personality characteristics of children by means of a home-training program. But it is within the school society that the widest opportunities are found for improving the social learning program of the younger generation. The world did not have to wait for Miller and Dollard's ingenious experiments with rats (60) to learn that children imitate. Apparently those teachers who have a high degree of person-to-person interaction with pupils are effective as models and are rated high as instructors (16). Positive directions, defined as simple, specific, approving, and unhurried, were shown by Johnson (45) to be superior to those of the negative type for young children. The results of studies of the influence of the nursery school as such, however, are equivocal (42, 98) since so many other influential factors are operating. More specific studies of group interaction can well be made, such for example as that by H. H. Anderson (3) of dominative and integrative behavior.

Evaluation—A distinctive feature of recent developments in educational psychology is the evolution of measurement into evaluation programs. After surveying 129 titles, Orata (63) concluded that evaluation still has a long way to go before it can fully justify its being associated with newer school practices. Yet it is these newer practices that are largely responsible for calling it into being. A two-year study (43, 102) of the so-called activity program in a group of elementary schools in New York City resulted in the conclusion that the activity classes are generally equal or superior to the traditional in intellectual, dynamic, and social performance factors, though there is evidence that they lag behind in certain school subjects, mainly arithmetic and spelling. A survey of the research findings (68) of the last twenty-five years of progressive education reports no loss in academic proficiency and gain in terms of personal and social development. The same favorable results were reported from a restricted study (51) of college performance of a group of students following a freer program of studies in high school when compared with an equated group taking the traditional required subjects. Equally favorable, but far more detailed, are the results of the Eight-Year Study sponsored by the Progressive Education Association (1).

Morale—Resulting from the present emergency, a number of articles are being published relating to the problem of morale. The *American Journal of Sociology* devoted its November 1941 number to this subject, and the *Psychological Bulletin* its June 1941 number. Few of the studies reported, however, have a direct bearing on educational problems. British psychologists (18, 21, 44), who have studied the effects of evacuation of school children to avoid air raids, found that though the problem is complicated by many factors, the disturbance is often not much less for those children who have been evacuated than for those who remained behind. Educators will need to contend with problems of adult morale as well, for

which a penetrating analysis by Allport and others (2) based on a study of ninety life histories of the Nazi revolution should prove enlightening.

Personality

Studies of various aspects of personality are many and often related to educational problems. Schettler (78) listed topical summaries of 308 items on personality traits. The recurring problem of what the personality tests measure was discussed by Bernreuter (12), who recommended that reference be made to Buros's *Mental Measurements Yearbook*, while Super (87) reviewed the research on the Bernreuter *Personality Inventory*. Brogden (15) ran a factor analysis of forty character tests and discovered Spearman's G and W, honesty, persistence, self-control, and acceptance of the moral code. With a revision of the A-S reaction study for women (76), favorable results were reported: negligible correlations with intelligence, around .35 between submission and introversion, and .44 between ascendance and persistence. Projective methods (27, 88) are gaining headway with the gradual secularization of psychoanalytic approaches and the promotion of the Rorschach technic (49). Pearson (66) called attention to a neglected aspect of experience, that of the effect of operative procedures on the emotional life of the child.

Investigations employing the Allport Vernon *Study of Values* and other instruments of evaluative attitude were reported by Duffy (25). Researches on what they refer to as emotionalized attitudes were reviewed by Briggs and others (13) who made their selection on the basis of what they considered would be of most interest and value to teachers. A novel attempt by the use of a modified Likert technic was made by Dexter (22) to measure changes in attitude produced by speakers; and rather striking differences in maturity of attitudes and interests of pre- and post-menarcheal girls of the same chronological age and social status were found by Stone and Barker (82). Probably the most intensive and far-reaching study of interests is being made by Sheviakov (81) and his collaborators; the use of interest questionnaires as a disguised form of personality inventory has possibilities of great significance. Evidence was cited by Super (86) to support the view that avocations are manifestations of dominant interests that do not find expression in vocations. When the regular vocation provides the needed satisfactions, there is no competition with the avocation for an individual's interests and energies.

Behavior Variables of Educational Significance

A number of phenomena of human personality have been investigated. One that has received considerable attention derives from Dembo's concept of the level of aspiration, studies of which have been made by Frank (26). It has been shown (20) that a knowledge of performance of other groups influences the level before firsthand experience with the

task but not afterwards. Also, subjects (37) tended to estimate their expected performance too low if the task was easy and too high if it was difficult. This tendency to estimate toward the mean of the group is difficult to explain since the estimates were given privately. Still more difficult is the problem of what to do with the pupils who aspire unsuccessfully to the social norm (80).

Frustration phenomena have likewise begun to attract experimental notice, especially since the Yale psychologists (23) linked them with aggression by a dogmatism they have since relaxed somewhat, perhaps in part because of the excellent analysis by Britt and Janus (14). Anthropological data, puzzles, removal of the bottle, puzzle boxes, memory span apparatus, and many other means have been employed to obtain observable frustration behavior, chiefly in children. While the phenomena stop short of the experimentally induced neuroses in rats and other subhuman species, they nevertheless strongly resemble problem behavior in school, a fact that is not without significance for teaching. The most ingenious and detailed experimental studies are those of Lewin and his associates, especially the frustration-aggression series produced under autocratic social climates (53), and the regression in constructiveness produced in a children's play situation (8).

A number of behavior variables deserve more study than they have yet received. Superstitiousness, for example, in child or adult is as valid an indictment of the school program as illiteracy. Ter Keurst (89) and others have found many hangovers of animism and supernaturalism, to say nothing of tenacious beliefs in obsolete tenets of antique science. In the sensory-motor sphere, clumsiness has been tentatively analyzed by Pear (65), and in the area of social relationships, gratitude by Baumgarten-Tramer (11).

In the generally neglected field of the sentiments Barry (9) found a high incidence of maternal bereavements during childhood in the case histories of over five hundred young psychotics. This problem is scarcely recognized by the schools, while nostalgia, though a problem chiefly to boarding schools, has a fairly extensive literature (58). Jealousy and envy, which often present the most difficult problems not only among pupils but also among teachers, were studied by Ankles (6) by means of an interview technic.

The nature of status is coming to acquire greater significance as a practical and theoretical problem. Writing from the sociometric angle Zeleny (103) defined it as the average intensity of the attitudes expressed toward a person by his associates, and cited evidence to show that it can be measured and controlled. Lippitt (56) approached the question by studying popularity, using the method of paired comparisons and observing social interactions, and found that children's and teachers' estimates were based on different criteria, the teachers', for example, being related to social participation. What Dudycha (24) called "dependability," which

consisted in promptness of college students in meeting appointments, coming to an eight-o'clock class, handing in assignments, and returning books to the library, was found to have no relationship to Bernreuter traits or, except for library dependability, to college grades.

Persistence (77), Thornton (95) found to correlate lower than the usual (.45) with scholastic achievement and he contended that the higher figure is spurious. Burton (19) demonstrated with preschool children a reinforcement of persistence after satiation in a pegboard task through social stimulation. These factors and many others are related to leadership, though different qualities are necessary for leadership in different situations. Hunter and Jordan (41) compared eighty-two college leaders with a control group and found them to be lighter in weight, younger, and higher in intelligence, scholarship, and interest maturity, and so forth. It is doubtful, however, if these differences, though statistically reliable, are as significant as others that their technic did not reveal.

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INTRODUCTION

THIS ISSUE concerns itself with research in the teaching of mathematics, including arithmetic, algebra, and geometry; the teaching of natural sciences, including astronomy, botany, chemistry, geology, physics, and zoology; and the teaching of such combinations of the natural sciences and of mathematics as are found in the curriculums of American public schools or in extracurriculum situations. General mathematics, biology, health, and physical science are included, but agriculture, home living, and geography are not.

Both the curriculum and the psychology of learning are reviewed as far as they pertain to mathematics and to natural sciences in any range of public-school activities, from the primary grades through the junior college. Thus the present issue becomes sequential to the issues of April 1937, dealing with "The Curriculum"; of December 1937, dealing with "Special Methods and Psychology of the Elementary School Subjects"; and of February 1938, dealing with "Psychology and Methods in the High School and College." Reports on research in extraschool education in mathematics and science and in the preparation of teachers of science and mathematics are natural extensions of the areas previously reviewed.

The bibliographies are selective rather than comprehensive, listing only a portion of the hundreds of investigations concerned with the teaching of science and mathematics made available during the period covered. Some research in other countries is included, but American research is considered for the most part.

Bringing together for the first time educational research from mathematics and science into a single summary was felt to create a need for a brief initial chapter examining critically the social and philosophical matrix from which research in education must stem. The remaining chapters are essentially reviews of research which include critical evaluations to a certain extent.

S. RALPH POWERS, *Chairman*
Committee on the Natural Sciences and Mathematics

CHAPTER I

Overview of the Period

SAMUEL RALPH POWERS and VIVIAN EDMISTON

National Association Reports

RESEARCH STUDIES have been both a stimulus of and a basis for the reports of national committees during the period reviewed here. The Commission on Secondary School Curriculum of the Progressive Education Association made the two reports, *Science in General Education* (20) and *Mathematics in General Education* (19). The report on the teaching of science to meet needs of adolescents in a democracy deals with student needs in four major areas: personal living, personal-social relationships, social-civic relationships, and economic relationships. It discusses science teaching in relation to reflective thinking and makes concrete suggestions about evaluating student growth in relation both to abilities which are "intangible" and to abilities which are easily measured. The report on the teaching of functional mathematics for general education purposes is similar to the science report.

Yearbooks of the National Council of Teachers of Mathematics have dealt with various aspects of mathematics teaching, namely: approximate computation (2), teaching high-school students to use logical proof in their everyday living (7), preparation of high-school mathematics teachers in the United States and in England and Wales (26), secondary-school mathematics (16), and arithmetic as a phase of general education (25). Each of these reports is mentioned in the present review at appropriate points.

Reports of the National Committee on Science Teaching of the American Council of Science Teachers of the National Education Association help to implement for the science teacher the recommendations of the Educational Policies Commission. *Science Teaching for Better Living* (17) presents the point of view that functional science has an important place in helping the individual to relate himself to the modern world and in furthering human betterment. *Redirecting Science Teaching in the Light of Personal-Social Needs* (6) stresses science teaching for meeting student needs. It gives an illustrative list of needs of students at various school levels. *The Education of the Science Teacher* (18) deals with the science teacher as a person and citizen functionally proficient in science and in teaching. *Effective Procedures and Materials for the Functional Teaching of Science* (14) makes concrete suggestions for improved science teaching that will prepare boys and girls for a democratic way of life in the world remade by science.

Research Bureau Reports

Some publications of the Bureau of Educational Research in Science (Teachers College, Columbia University) are already available, as is pointed out in Chapter VI. The Bureau has identified major problems of our society and has presented in a series of books for teachers (4, 8, 9, 12, 13, 22, 24) the interrelations of those problems with various areas of the sciences. Through the coming year there can be anticipated further publications: *Suggestions for Teaching*, which will report experiences of teachers who have taught in these problem areas; materials directly usable by high-school students; and further research studies on children who relate their science learning to social issues.

Comprehensive Studies

Science and mathematics have been handled as part of the educational matrix in each of the comprehensive studies in the period under review. In general the superiority of students having experimental activity programs over students having traditional programs is reported as inconclusive for science and mathematics and as actual for social understandings. In New York City ten selected experimental grade schools carrying on activity programs during the past six years were compared with ten matched schools offering regular programs. Morrison (15) reported that sixth-grade children in the activity program were much the same as those in the regular program in performance on arithmetic and science tests, and in "scientific outlook" and "interest in arithmetic." "Neither program has demonstrated as yet any superiority over the other in helping children to master that important area of arithmetic known as problem solving. . . . Neither does the analysis indicate that either program has any marked advantage over the other in . . . arithmetic computation." However, the study showed the attitude, "lack of subservience," and the ability to apply generalizations as more characteristic of children in the activity program than in the regular program. According to teachers, effects of the activity program included: "Children are more independent. . . . Enlarges children's world. . . . Children learn to defend own point of view. . . . Develops critical-thinking—scientific approach. . . . Children are more democratic. . . . Children seem to understand what they are doing and why. . . . Children learn to make decisions wisely."

At the secondary level, the Eight-Year Study (1, 5, 10, 20, 23), followed closely 1,475 graduates from "thirty schools" and a like number of matched students graduated from other high schools. Data obtained were interpreted as showing the desirability of revised bases for college entrance. Performance on intelligence tests, the pattern of student abilities, and evidence of achievement in an area of special interest during high school were found a better basis for recommending that a student be admitted to college than the usual requirements of a specified number and pattern of high-

school courses and a minimum average grade. In college, students from the "thirty schools" earned higher grade averages in both science and mathematics than did their matchees. Students of the experimental schools were judged superior in relation to certain abilities often implied in the term *scientific attitude*, namely: intellectual curiosity and drive; precise, systematic, and objective thinking; clear ideas concerning the meaning of education; resourcefulness in meeting new situations; ability to approach problems of adjustment effectively; active concern with what was going on in the world.

For the junior-college level, the Cooperative Study in General Education is in progress and deals with twenty programs of general education designed to meet student needs. For institutions concerned with the preparation of teachers, the report of the Commission on Teacher Education on its five-year study in thirty-four selected centers may be anticipated within one year.

Emphases of Reviews in This Issue

The present issue shows both the continuance of research along customary lines and the initiation of research compatible with current educational thought. Studies have included reports on the status of teaching personnel, course content, methods, and materials in use. At the elementary level, arithmetic readiness and grade placement received attention; and the interpretation of what constitutes elementary science has been broadened from nature study to study of all fields of science. At the secondary level, survey courses and functional courses in harmony with student needs and interests have been considered. In the preparation of teachers of science and mathematics, such studies as that of Burnett (3) have shown that teachers feel thwarted by their inability to deal with significant problems of our society and have need of more functional preparation in professionalized science.

Learning studies have dealt with the effectiveness of methods and devices associated both with traditional teaching and with newer practices. In elementary arithmetic, methods of teaching specific skills were studied, but so were methods of teaching children to solve problems and to use generalizations in doing so. In general, learning studies are becoming less concerned with how children learn and more concerned with how children learn to solve real problems and carry on purposeful activities. Considerable research has been directed toward audio-visual aids to learning. Especially in the teaching of elementary science, radio broadcasts and motion pictures were found useful in changing the behavior of boys and girls. The last five years have also included studies such as that of Greene (11) showing the effectiveness of learning through activities which are meaningful to children.

Needed Research

Especially worthwhile would be studies of changes produced simultaneously in understandings, critical thinking, attitudes, and overt behavior. Such studies can be carried out more easily when further tests and other research tools become available. Further research concerning survey courses in science and functional courses in mathematics at the secondary-school level is needed. The problem of what curriculums are most suitable for preparing teachers especially competent in mathematics and in science offers many angles to be investigated.

The participation of the United States in the present world war creates new areas for educational research. Already there has been much revision of present curriculum materials and much preparation of new materials, especially in science areas. The furthering of "air-mindedness" has brought curriculum modifications; so has the program of the Office of Price Administration with its advocacy of changes in consumer habits. The effectiveness of such curriculum materials should be studied.

Brief mention of aspects of the present emergency closely related to the teaching of mathematics and science is in order. At present, two national objectives are to win the war and to aid in laying a suitable foundation for an improved world in the postwar era. For students approaching draft age, specialized vocational needs in science and mathematics must be considered. For those less close to military age there is need for general education pertinent both to the present and to the postwar future. The educational problem involved in providing for a better world is no small one. Among the many areas in which more complete understanding is needed are: (a) health, as shown by the fact that 45 percent of those applying for military life were found to be physically unfit; (b) American capacity to produce materials and energy, to regulate their flow through communities, and to consume their finished products; (c) biological and social aspects of the human life span from childhood, through adolescence and youth, into adulthood, and then old age; (d) world-view, as developed through use of scientific methodology; and (e) intercultural and interracial problems, including those arising from classes and castes and from linguistic differences. The facing of such problems with our students today will make it easier for them to face these problems when they become adults.

Teachers of mathematics and science are challenged by current problems of society to be as effective as possible in their classroom teaching, in their guidance contacts with students, and in their community responsibilities. Research workers are challenged to ascertain what curriculum materials and methods are most appropriate for boys and girls in a world at war, and later in a world seeking a more stable form of organization.

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CHAPTER II

Teaching of Science in Grades I through VI

FRANCIS D. CURTIS

RESearch IN THE TEACHING OF SCIENCE at the elementary-school level is less abundant than that at the junior and senior high-school levels. Two plausible reasons to account for this fact are that science is not yet established as a major area in the elementary program of studies, and that elementary-school teachers as a rule are not so well trained in the subject-matter of science as are the teachers of the junior and senior high schools. It is encouraging, however, to note the appearance of an increasing number of studies of significance and merit in the teaching of elementary science.

Trends and Objectives of Elementary Science

Underhill (15) conducted an extensive historical investigation of the development of the elementary science program since 1910. He divided his survey into six chronological periods and attempted to determine for each period the trends with respect to the objectives of elementary science and the ways in which educational theory has influenced the selection, organization, and presentation of materials of the elementary-school program. He pointed out the objectives of modern elementary science as being concerned primarily with teaching generalizations which function directly in thinking, with scientific methods of thinking, and with scientific attitudes. He pointed out also that "leaders in general education have recently stressed the place and significance of science . . . in daily living"; but that "in spite of such emphasis, specialists have given little help to the teacher in formulating specific programs to realize these potentialities." He concluded that the approach to the curriculum of elementary science lies in providing situations within which the learner may have the opportunity for problem-solving activities on problem situations which are significant to the children and at the same time are significant for the future.

Zintz and Kambly (16) made a critical analysis of 106 recently published units of elementary science found in twelve educational periodicals. They found the general objectives of elementary science to include the development of scientific attitudes and training in the use of scientific method. The teaching of scientific principles, so prominently stressed in recent research reports and authoritative books and articles, as a major objective of all courses of science at the elementary- and secondary-school levels, did not appear as an objective in these sources. The chief teaching emphasis was placed on arousing and using children's interests.

Evidence of the importance of teaching principles of science as a major objective of elementary science was presented in an investigation by Hankamp (8), who concluded that the present tendency is "to decrease the

long list of general aims to two or three major goals of instruction and to state specific objectives in terms of large subjectmatter generalizations." Russell (14) secured the opinions of fifty-one "well-known educators" relative to various aspects of elementary science, employing a questionnaire of fourteen parts. The opinion of this group was that elementary science should not be concerned with mere fact-getting but that it should be developed with primary emphasis on teaching important principles, developing scientific attitudes, and using scientific method. The incidental teaching of science meets with majority disapproval. Almost three-fourths of this group favored the organization of units around concepts rather than around topics.

Curriculum of Elementary Science

Investigations of the materials which are now found in, or which should be included in, the elementary science program are more numerous than studies of any other kind in this field. Only a few of the more significant or typical ones can be mentioned in this brief review. Probably the most elaborate and extensive investigation of curriculum materials of elementary science is that by Bruner and others (4). This study included the analysis of forty-two courses "judged outstanding" by the Curriculum Bureau of Teachers College, Columbia University, and distributed fairly evenly among Grades IV, V, and VI. Practically all these courses were found to include unit materials on astronomy and earth science—two aspects of science that are almost universally included in courses of general science but which are rarely found in the courses at the senior high-school level. The investigators found no evidence of a sequence of materials in science planned for the intermediate grades, a condition which they attributed to the lack of scientific evidence relative to the placement of materials. The environmental approach was found to be the one most frequently used in these courses in science for the intermediate grades.

Zintz and Kambly (16) also found that the units analyzed in their study reflected a tendency to make extensive use of the immediate environment. Like Bruner, moreover, these investigators found little agreement with respect to the placement of units when they analyzed 106 recently published units of elementary science.

Fish (6) investigated the content of six health readers, nine science readers, and twelve general readers, written for Grades I, II, and III. She analyzed the materials for scientific facts which she classified under the following eleven headings: animals, plants, earth science, astronomy, weather, making work easy (fire, electricity, details of modern invention, and mechanical progress), neatness and cleanliness, safety, nutrition, care of the body, and mental hygiene. She found that the median numbers of scientific facts per page were 3.4 for the science readers, 2.2 for the health readers, and 1.2 for the general readers. She found that the books as a whole contained not only more stories about animals than about plant life

or physical materials but also about two and one-half times as many scientific facts about animals as about plants. The major proportion of the facts in the health readers dealt with care of the body, cleanliness, and nutrition.

A significant recent shift in the point of view with respect to the sources of material which should make up the content of elementary science is revealed in Hankamp's study (8). She stated as one of her major findings that specialists in science education are "almost unanimous" in their conviction that some aspects of all the fields of scientific knowledge may be taught to elementary-school children. This statement reveals the present trend for a broad program of elementary science to supplant nature study which formerly constituted most of the science taught in the grades and which still persists as the sole offering in many elementary schools.

Palmer (13) reported a survey of the teaching of science in the elementary grades of 154 communities in 26 states. Unfortunately the report failed to include descriptions of the various phases of the study or of the technics employed in investigating them. Some of the findings, however, especially those dealing with definite provisions for instruction in elementary science, are of interest as indications of modern trends. Palmer stated that 110 of the 154 communities provided a definite time in their programs for the teaching of science in the elementary grades. Florida was found to lead all the other states represented in the study in the number of minutes devoted to elementary science. The subjectmatter topics most prominently emphasized in the sources analyzed were conservation, health, and humanness. The lack of details in the report prevents a comparison of the findings of this study with those of earlier studies of the status of elementary science, such as those by Patterson and Palmer.

One factor which has long hampered the expansion of the elementary science program is the meager training possessed by the average elementary teacher in the various fields of science. Realizing this lack of fundamental knowledge of science on the part of teachers, administrators have hesitated to introduce elementary science into the grade-school program; and many elementary teachers fearing to venture into unknown fields have sturdily and effectively resisted all movements to expand the elementary science curriculum. Hankamp (8), however, from her survey of professional literature on the teaching of science, found evidence that the regular room teacher is capable of teaching elementary science, if she can be aided by the counsel of a specialist in science.

Trends and Innovations in Teaching Practices

Significant chiefly because of its emphasis upon the modern shift away from conventional teaching materials and practices is the study by Greene (7) of the relative values of teaching science with and without the use of plays. He placed 405 fifth-grade children under 40 teachers in three pairs of groups "as nearly equal in size as geography and their own choice would

permit." Each teacher taught first a "nondramatic" unit by more or less conventional methods and then taught a dramatic unit with which a play was the major activity. Of the six plays used with the "dramatic" units, four were written by teachers and two by the children who filled in outlines supplied by the teachers. Two of the six plays were written for child actors, two for marionettes, and two for both child actors and marionettes. The investigator found little difference in the amount of factual information learned by the two methods. He concluded that if only gain in factual information is wanted, the dramatic method will not justify the expenditure of time required in its preparation and presentation, but that the greater interest aroused by the dramatic method justifies the greater expenditure of time. Better results were secured when the pupils wrote their own plays than when the teachers wrote them. More desirable traits and attitudes were furthered by the dramatic than by the conventional methods, and the dramatic method lends itself readily to the correlation of science with other subjects.

Arnold (1) used 90 fifth- and sixth-grade pupils for his experimental group and 83 for his control group. With the experimental group he used a "problem-discussion" technic with 25 items, which are found to be similar to some of the types used earlier by Curtis in his Test of Scientific Attitudes. Arnold arrived at these conclusions which are pertinent to the teaching of science: In terms of average growth the experimental group in three months of learning to use scientific thinking made growth which would have taken nine months without instruction. ". . . this study supports the hypothesis that critical thinking can be taught in elementary schools whenever time is taken to give adequate consideration to our purposes and procedures." This last statement agrees with the conclusion of Weller from her earlier study of attitudes and skills in problem-solving with sixth-grade classes in elementary science. Also the results of this study supplement in a valuable way those of Croxton's and Haupt's earlier studies of another phase of the objectives of science teaching, namely, the teaching of generalizations. Both these investigators found that children of all six grade levels were capable of making generalizations.

Bailey (2) made a pioneer attempt to ascertain the difficulty which children experience in comprehending scientific concepts discussed in textbooks at both elementary- and secondary-school levels. The subjectmatter area investigated was that dealing with power. The investigation extended through 20 fifty-minute periods; the degree of understanding of "power" was measured by a specially constructed test of facts and principles, administered at the beginning and the end of the investigation. The investigator concluded that "science concepts pertaining to power cannot be satisfactorily developed by pupils with a mental age of 160 months or less."

Mullen (12) worked with four hundred children in five grades of elementary schools in New York City to determine their reactions to certain living animals. Each child studied the same animal for fifteen minutes on

each of three successive days. The questions asked and the comments made were recorded and subsequently analyzed. Mullen concluded that while all children carry on perceptual thinking, only about 6 percent of the children involved in her study attempted to solve problems which they themselves had raised, and that only about 3 percent made generalizations. This study is reminiscent of Finley's pioneer study of children's reactions to a mud-puppy, but it reflects modern trends in the teaching of science, namely, emphasis upon reflective thinking, problem-solving, and the making of generalizations.

Investigations of the Value of Radio and Films

Two studies of the values of the radio as a teaching aid deserve special mention, those by Brewer (3) and Miles (9). Brewer (3) worked with an experimental group of 795 children in 25 classes and a control group of 859 children in 27 classes, all in schools of New York City. He used five broadcasts based on certain concepts or aspects of nature. With an elaborate and careful statistical technic he secured results which led him to conclude that "radio programs do serve as a definite stimulus to further activities." He found also that there was some gain by the experimental groups in factual information and in the understanding of concepts either as a direct result of the broadcasts or of the stimulus they provided.

In the second study Miles (10) attempted to determine the effects of broadcasts upon increasing the children's knowledge of problems of conservation of wildlife and natural resources, and in developing both interests in conservation and attitudes favorable to it. The experimental group consisted of an unselected and probably representative sampling of city children in 5 fifth-grade and 4 sixth-grade classes, and the control group of 10 similar classes, equated approximately with the experimental classes on several bases. A series of 13 broadcasts specially prepared by fifth- and sixth-grade teachers of science was used with the experimental group. The results of specially constructed tests administered twice during the year indicated statistically reliable evidence that the use of the radio resulted both in an increase in information and in a shift of attitudes. With respect to the development of interests in conservation, Miles found that "the amount of time devoted to utilization (that is, to considering the materials discussed in the broadcasts and to engaging in activities related to the broadcasts) was an important factor in developing the pupil's interest in conservation." He also found that the radio classes which "spent the most time in utilizing the broadcasts were the only radio classes showing a gain in interests." These results would seem to add evidence in support of the general thesis that desired outcomes cannot be expected to result incidentally but must be planned and taught for specifically.

Experiments to determine the values resulting from the use of films at the elementary-school level have been rare. Cobbs (5) reported such a

study. He used three experimental groups and three control groups made up of children in Grades I to IV in 6 schools. Both experimental and control groups studied the same 3 units for the same length of time under their regular teachers. The experimental groups devoted 30 minutes per day twice a week for 6 weeks to viewing talking pictures on aspects of natural science. The teachers of these groups were supplied with handbooks to supplement each unit of instruction. The teachers of the control group were permitted to use any teaching aids they wished other than the films and the handbooks used by the teachers of the experimental groups. Tests used to measure both immediate and delayed recall revealed consistent gains by the experimental groups over the control groups. No differences in learning by the two sexes were discovered.

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CHAPTER III

Teaching of Science in Grades VII, VIII, and IX

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Scientific Interests at the Junior High-School Level

STUDIES OF CHILDREN'S SCIENTIFIC INTERESTS have always had a prominent place among research investigations because of the guidance their findings may provide in the selection of basic or supplementary curriculum materials. Zim (30) reported an elaborate and extensive study of the interests and activities of "younger adolescents," chiefly in the seventh, eighth, and ninth grades of four schools. He gathered his data from a series of analyses: (a) answers to a questionnaire based on 184 topics grouped into 29 scientific and 5 miscellaneous categories; (b) English papers written by 1,161 boys and girls on "The Thing I Would Like To Do Best in Science"; (c) preferences expressed and questions asked by 65 classes viewing 9 science exhibits for 10 minutes; (d) choices by 1,114 boys and girls of science films involving use, understanding, and manipulation; (e) responses by 762 boys and girls to a questionnaire based on 107 questions "which adolescents might wonder about"; (f) 667 additional questions written upon the questionnaire blank by the respondents; and (g) several hundred individual entries in science fairs. Zim concluded that the interests of adolescents are expressed through acceptable channels of science; that adolescent interest is typically expressed in relation to a specific phase or topic of science rather than to general areas or school subjects; but that school science does not seem to be an important source of adolescent interests. He found that boys and girls exhibit definite differences in scientific interests, activities, and preferences; but that both sexes exhibit strong preferences for science related to health, growth, reproduction, and animal life.

Ruffner (22), using a technic not adequately described, with parallel groups "as nearly alike in all respects as possible," sought to determine pupils' interests in general science and to measure the changes of their interests within a given time. From her data she concluded that there is sufficient permanence or stability of the scientific interests of pupils to serve as a major criterion for the selection of subjectmatter in general science for the eighth or ninth grades. This conclusion agrees in general with that of Zim (30) who stated that "adolescent interests are permanent enough to warrant use in the curricula if justified on educational grounds." The conclusion contrasts sharply, however, with that which Fitzpatrick based upon the results of an earlier extensive study in which he found pupils' scientific interests so unreliable as to render grouping of subjectmatter material upon the basis of interests "of dubious value."

Another aspect of pupil interests relates to the difficult and important problem of motivation. Teachers of science in the senior high school are frequently heard to complain about the difficulties they have in motivating their courses in special fields of science because the interest of the pupils has been dulled as a result of their having studied general science. Similar complaints of the diminished interest of pupils in general science as a result of their having studied elementary science are rarer. Nevertheless this latter situation influenced Matteson and Kambly (19) to investigate the extent to which material covered in the usual seventh-grade course of general science has been acquired by pupils before entering the seventh grade and to determine also the gains made in general science by pupils who had been taught science in the elementary grades over those who had not. A test of 199 questions, chiefly factual, was administered to 573 seventh-grade pupils, some of whom had studied science in the elementary grades and the rest had not. The administration of the test preceded all work in general science. The investigators found little difference between the scores of the two groups; that is, they found no evidence indicating that topics had been adequately covered in the elementary schools. They recommended that teachers emphasize the cyclic arrangement of subject-matter, and the need for review along with the study of new materials.

Analyses of General Science Textbooks

More than twenty years ago Howe used data which he secured chiefly from an analysis of textbooks in an attempt to answer the question, "Can and should general science be standardized?" Several recent analyses of textbooks present evidence with respect to whether the content of general science has yet been standardized. Graham (9) selected 19 units from Curtis' *Synthesis and Evaluation of Subject-Matter Topics of General Science* (1929) and divided these units into 124 subdivisions. He then compared the content of 8 recent textbooks of general science with these subjectmatter subdivisions to determine the extent to which the books conformed with the list from the synthesis. Graham also computed the number of square inches of space devoted in each book to each topic. He found that five of the textbooks devoted space to all 19 units and that the remaining three devoted space to 18 of the 19.

Simmons (24) analyzed the content of 4 textbooks of general science for each of four chronological periods. He computed the "percentages of space" devoted to each unit. He found that 16 units predominated in the books of all four periods. Both Graham and Simmons concluded that authors of modern textbooks of general science are generally agreed upon what materials should constitute the texts. This conclusion agrees with that of Davis but contrasts sharply with that of Wolford, both of whom analyzed textbooks of general science of a not much earlier period. Wolford

stated that "there is very little agreement among writers as to what should be included" in a textbook of general science.

Evidence that the contents of the separate books of three-book series of general science are not standardized is presented in several studies. Pettit (21) analyzed the content of 5 seventh-grade, 4 eighth-grade, and 4 ninth-grade textbooks of three-book series to determine the degree of uniformity of content with respect to units, topics, and basic concepts in corresponding books. From his detailed findings he concluded that there is "little agreement among the authors of the several books as to what content should be included at the various grade levels and in the definite subject-matter areas." Vander Ploeg (26), LeCocq (13), and Huffman (12) made companion studies similar to that of Pettit of, respectively, seventh-grade, eighth-grade, and ninth-grade science textbooks of three-book series intended for the junior high school. Vander Ploeg and Huffman found a distinct lack of uniformity in the content of different seventh- and ninth-grade books, but LeCocq reported a considerable degree of such uniformity in the eighth-grade textbooks of three-book series. From these various studies it would seem that single textbooks of general science probably agree more closely in content than do corresponding volumes of three-book series.

Vocabulary burden—Some evidence of the nature and the appropriateness of the vocabulary used in textbooks of science is found in a summary by Curtis (5) of a hundred separate investigations (most of them master's theses) of the vocabulary of textbooks of science for the junior high school and senior high school. The combined data of the studies dealing with general science are interpreted as indicating that the vocabularies of textbooks of general science are too difficult for the pupils for whom the books are intended; that the textbooks contain many technical and nontechnical words, the meanings of which the pupils do not know; that there is too little repetition of both scientific terms and difficult nontechnical words; that difficult nontechnical words constitute too large a percentage of the difficult vocabulary of textbooks of general science; that not enough of the scientific terms used in such textbooks are defined; and that too frequently the definitions fail to appear in the books until the words have been used several times. The conclusion that the vocabularies found in textbooks of general science are too difficult agrees with similar conclusions reached by Powers and Pressey in their pioneer studies published more than ten years earlier.

Despite militant advocacy by educational leaders of the use of many sources of subjectmatter, not much progress in this direction seems as yet to have been made. Graham (9) found that only one textbook of general science was used in 87 percent of the schools to which he sent his inquiry. A decade earlier, Curtis, in a study of the teaching of science in the schools of the North Central Association, found 89 percent of the teachers of general science using only one textbook.

Progress in Developing Scientific Thinking

The importance of developing scientific attitudes in pupils of all grade levels has been stressed so persistently in the *Thirty-first Yearbook* and in other authoritative sources that it has become widely accepted as a major objective of science teaching. How successfully scientific attitudes can be "taught" has not yet been determined unequivocally by research evidence, one reason being that entirely satisfactory tests of scientific attitudes have not yet been devised.

Eberhard and Hunter (6) attempted to discover the extent to which scientific attitudes could be developed through direct teaching. They used three groups paired approximately on the bases of mental age and sex. Group I was studying general science; Group II had previously completed a year of general science in which little or no emphasis had been placed upon scientific attitudes; and Group III had had and was having no instruction in science. Group I received 7 months of instruction in which every effort was made to teach the various scientific attitudes specifically and thoroughly. Comparisons of the groups were based upon scores on Hoff's "Test of Scientific Attitudes." The investigators found no evidence that their attempts to teach scientific attitudes resulted in developing such attitudes. They expressed doubt concerning "the ability of changing the skill in science thinking through classroom teaching procedures carried on for the time given in this experiment."

Blair and Goodson (3) attempted to determine the results of direct teaching of several of the scientific attitudes and various elements of scientific method. They used three groups of ninth-grade pupils: Group I, composed of 32 pupils, was given, along with the regular course in general science, specific training in scientific thinking; Group II, composed of 49 pupils, was taking a course in general science taught according to usual methods; and Group III, composed of 89 pupils, was not studying science at all. Results were measured by scores on Noll's "What Do You Think?" Form 1. These investigators found in contrast with Eberhard and Hunter, a marked improvement in scientific thinking secured through the general science course "when special attention is given to obtaining this outcome and when specialized learning exercises . . . are utilized."

Further evidence bearing indirectly upon the teaching of scientific attitudes was secured by McKnelly (16) from his study to determine the values derived from free reading. This investigator used 48 pairs of pupils in 4 ninth-grade classes matched approximately on the bases of sex, IQ's, and scores on the Ruch-Popenoe General Science Test, Form A. During 8 months, the experimental group devoted one period per week to free reading in general science, while the control group spent the corresponding period in detailed discussion of science materials. Subjectmatter tests and Curtis' "Test of Scientific Attitudes" were administered at the end of the experimental period. All the results, though not statistically significant, favored the experimental group. McKnelly interpreted his findings as

indicating that scientific attitudes should be taught directly if they are to be the outcomes of science teaching. This conclusion agrees closely with that of Curtis and of Blair and Goodson (3). The latter two stated that "the mere study of general science does not in and of itself make a unique contribution to the development of scientific attitudes."

Scott (23) reported a study which involves such scientific attitudes and elements of scientific method as making observations, drawing inferences, and weighing evidence. A class of junior high-school pupils made first a study of the advertising of automobile batteries, then individuals and small groups made dissections and other studies of batteries by means of laboratory projects of various sorts. Later they checked against the advertising claims the observations they had made during these activities. Scott concluded that the average junior high-school boy is likely to be impressed by the "massive type" of advertising and to accept misleading generalizations in such advertising, but that he is willing and can be trained to seek out the facts. The investigator expressed the opinion that a study of advertising is worthless unless it be accompanied by laboratory methods to stimulate interest and to aid understanding.

Superstitions—Studies of superstitions and unfounded beliefs in general are important because superstitions are involved in the scientific attitudes. A considerable number of studies of superstitious beliefs, conspicuously those by Caldwell, Lundeen, Zaph, Salt, Weller, and Maller, have been contributed during the past decade. Three recent investigations merit addition to the list. Vicklund prepared a six-week unit on superstitions using for the background Caldwell's and Lundeen's list of unfounded beliefs. He taught this unit to 135 pupils in 4 classes of general science, giving the same test at the beginning and at the end of the experimental period. His major conclusion confirms the important one reached earlier by Caldwell and Lundeen, namely, that superstition and other unfounded beliefs can be diminished by direct teaching of facts. He reached the further conclusion that the most difficult false beliefs to remove are those related to health and mental telepathy because "they are deeply rooted in religion and other emotional areas." Salt had reached a similar conclusion earlier with respect to false beliefs related to health. The importance of misconceptions with respect to health is emphasized in the results of a study by Hancock (10). This investigator secured the help of 53 selected judges (subscribers to *Science Education*, authors of articles in that journal, members of the National Association for Research in Science Teaching, and experienced science teachers) in evaluating certain popular misconceptions in science. Their combined judgments indicated that certain misconceptions relative to health have "greater potentialities for affecting the behavior of the believers than the other misconceptions submitted for evaluation."

The third study of this group, one by Ter Keurst (25), was planned to measure the degree of acceptance of superstitious beliefs pertinent to personality adjustment, by 237 white boys, 212 white girls, 70 colored boys.

and 62 colored girls in Grades VII, VIII, and IX. From an analysis of original sources he obtained a checklist of 92 beliefs which were judged to be of high relative significance by 7 specialists in psychology. From the results obtained by administering this checklist, Ter Keurst concluded that belief in superstitions does not decline with advance in grade level. He found the "mean percentages of acceptance" much greater among the colored pupils than among the white. These results agree in general with those found earlier by Salt. Ter Keurst found that the "superstitions most prevalent referred to the animistic role of Nature, supernatural manifestations, and deterministic viewpoints of life."

Exploring and Providing for Individual Differences

Little investigational evidence is yet available to assist the teacher in solving the important and puzzling problems resulting from the individual differences of pupils. A valuable contribution to this area is that of Beauchamp (2), who had for his major objectives the determination (a) of the nature and extent of individual differences in attaining specific learning products in science; and (b) of the factors influencing the progress of pupils in the attainment of specific learning products. His subjects were 21 unselected "subfreshmen of the University of Chicago High School who were found from the results of a battery of tests to be superior in intelligence and in rate and comprehension of reading, and to represent a wide range in experiential background and quality of application." The materials used in the experiment were four units of science organized and administered in accordance with the Morrison Unit Plan. Beauchamp's conclusions emphasize the complexity and difficulty involved in teaching and learning. He stated that though progress in the study of science is definitely related to intelligence, ability to read, experiential background, and sustained application, there are so many exceptions to this general relationship that individual progress can be interpreted only in the light of observations of the pupil's methods of work. He stated also that the learning situation is both extremely complex and in a state of constant flux, with the result that it is practically impossible to isolate one factor and definitely determine its causal effects. His further conclusion that individual differences affect pupil progress more than the method of teaching does affords an interesting comparison with the conclusion made earlier by Corbally who stated that the determining factor is the *teacher* and not the method or device.

The third part of Beauchamp's study, to determine the effect of instruction in learning to make comparisons, is an extension of his first major investigation in teaching study habits published earlier, and indicates, as did the other, that direct instruction in study habits pays substantial dividends.

The value of individual help given by the teacher to each pupil as a means of providing for individual differences is indicated in a study by

Olson and Kambly (20) of the relative effectiveness of three types of teacher activity during the directed-study period. The investigators worked with three "nearly equivalent" groups of pupils in ninth-grade general science, using for the instructional materials units organized and taught in accordance with the Morrison Unit Plan. Conditions with the three groups were controlled so that only the teacher-activity varied with the groups. The pupils of one group worked together aided uniformly by the teacher; the pupils of the second group worked individually while the teacher proceeded from pupil to pupil aiding each, whether or not the pupil asked for help; the pupils of the third group received help from the teacher only when they requested it. The investigators found that the individual method resulted in the greatest amount of factual learning and that the "help requested" method resulted in the least. They noted a tendency in the "group" method for some pupils to depend on the more able pupils of the group.

Trends and Innovations in Teaching Practices

Studies of methods and materials by means of which to enrich and supplement courses of science are stimulating and valuable. Several such studies deserve mention in this brief review. Carpenter (4) reported a study in which 40 recordings of science lessons were listened to on the radio by approximately 11,000 children in 307 general science classes in 136 cities and towns of 36 states. Bulletins containing suggestions of teaching devices and tests based on the records were distributed for the teachers' use. The results from the suggested procedures employed with the recordings were determined from opinions and comments by teachers and supervisors, extracts from pupils' letters, and the results of a final test on factual information. The findings were interpreted as indicating that through the use of the recordings the pupils gained confidence in the scientific method and its findings; that their interest in science was stimulated; and that their growth with respect to certain of the scientific attitudes was increased.

Hollandsworth (11) analyzed the activities of a summer camp to find ways in which they contribute to the science course through affording background and experience useful in relation to the work in general science. The activities of camp life were compared with a list of topics under 21 units obtained from the three-year outline of general science for Grades VII, VIII, and IX in the Pennsylvania Course of Study for 1933. Hollandsworth concluded that a summer camp "offers a wide background of experience for a general science course through 62 percent of its activities." Also he found that 75 percent of the topics that are included in a course of general science were found in normal camp activities.

The growing trend toward the integration of subjectmatter fields with out-of-class experiences finds some support in the results of a recent study by Word and Davis (28). These investigators attempted to measure the acquisition and retention of factual information by seventh-grade pupils

in a general science course. Using 3 groups of pupils, they administered a test at the beginning and a second one at the end of each of 9 two-week intervals. The repetition of the second test at the end of each following interval made possible the determination of retention. From the data secured the investigators concluded that pupils retain more readily the materials of general science which relate to particular interests, hobbies, or out-of-school environment, and to materials related closely to those presented in other courses.

Use of Silent and Sound Films

The values of motion pictures as supplementary aids to instruction have been convincingly established by numerous research investigations in several fields. McCowen (15) contributed a carefully controlled experiment of this kind in which substantially better (though not statistically reliable) results were secured with films and slides with a seventh-grade class in general science than were secured without these supplementary visual aids with an "equivalent" class. The relative values of sound and silent films or of the use of films as a substitute for other teaching practices or materials of instruction, however, have not yet been determined though often investigated. Maneval (18) contributed evidence with respect to the relative values of sound and silent motion pictures in teaching science to eighth-grade pupils. He employed the unusual device of using the same educational sound motion pictures with both experimental and control groups but eliminated the sound and used captions with the control group. His experimental and control groups consisted each of 152 pupils paired on the bases of mental age, sex, and reading ability. Eight pictures were shown with 4 units of subjectmatter. On the whole the results shown by tests, though not statistically significant, favored the silent films both for immediate and delayed recall. The investigator concluded that pupils of higher mental ability learn better with silent films, but that those of lower ability learn better with sound films.

Maneval (17) contributed evidence also with respect to the relative values of the use of sound motion pictures and of printed study sheets made to resemble science textbooks and workbooks. From eighth-grade classes in general science he selected 2 groups, each composed of 140 pupils, paired on the bases of mental age, sex, and reading ability. He rotated the groups after each 30-day period of instruction so that each group was taught two units with films and two with study sheets. With all four units the results of tests measuring immediate recall of factual information showed statistically significant advantages in favor of the use of the study sheets over use of the sound motion films; and with three of the four units the test results for delayed recall likewise showed advantages favoring the study sheets. None of these advantages, however, was statistically reliable.

Some evidence of the unreliability of pupils' judgments with respect

to the relative values of teaching methods is supplied by the responses of the pupils with whom Maneval experimented. Responding to a questionnaire, 63 percent stated that they thought they had learned more from films than from study sheets. Seventy percent of the pupils expressed a preference for the film method over the study-sheet method.

Workbooks

The trend to use workbooks, though widely followed, has recently received much vigorous condemnation. Not much investigational evidence, however, has yet been secured which indicates the desirability either of using or of abolishing workbooks. Anderson (1) reported an experiment with two "equivalent" groups, each of 40 students, with which he tried to determine the effect of the use of a workbook on achievement in general science. The results showed greater progress by the group using the workbook, and showed also that the pupils of higher intelligence tended to profit more from the use of the workbook than did those of lower intelligence. This latter finding agrees with that of Peterson and Douglass in their earlier study of the effects of using workbooks with general science classes.

Morrison Unit Plan

From the time of the first published investigation of the relative values of different methods of teaching science, that of Gilbert in 1910, there have been numerous learning studies of this type. A recent one by Forsyth is interesting because of its bearing upon the trend toward a less extensive use of the Morrison Unit Plan. Forsyth investigated two methods of teaching general science with two groups of eighth-grade pupils, one a group of 40 pupils who had made superior marks, and the other of 25 pupils who had poor achievement records. He rotated the teaching methods 5 times during a semester. He taught one group by a "study-assignment" method in which he gave a definite assignment for study followed with recitation, discussion, and test; he taught the other by a "lesson-guidance" method in which he used the Morrison Unit Plan. At the end of each rotation he administered to each group a test of factual information. He obtained statistically reliable results in favor of the use of the unit plan with the superior pupils and favoring the conventional method for the duller pupils. This study goes a step beyond Corbally's somewhat similar earlier experiment in which no advantage was found in favor of either the use of the unit plan or the employment of conventional procedures with mixed classes in general science.

Concluding Comments

In reviewing the research investigations in the fields of elementary- and junior high-school science for the period covered by this volume one is

impressed by evidences of several trends: (a) There is an increasingly strong emphasis upon the teaching of principles of science, the developing of scientific attitudes, and the training in the use of the elements of scientific thinking—as major objectives of science courses at all levels through the elementary and junior high schools. (b) There is a large proportion of investigations, the findings of which add validity to the thesis that the desired outcomes of instruction are not secured incidentally or accidentally but can be insured only by teaching directly for them. (c) There is marked evidence of the movement away from conventionalized materials and procedures toward enrichment and supplementation of content, devices, and materials.

On the whole the investigations of this period for the levels here reviewed are of a higher degree of excellence than are those of similar earlier periods for the same levels. There is a marked improvement of investigational technics employed, especially in the learning studies. There are still many studies in which inexcusably crude technics are used, but the number of such studies is decreasing.

One cannot help decrying the fact that investigations of major significance remain unpublished while many others of mediocre importance and merit are reported in our best educational magazines.

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CHAPTER IV

Teaching of Mathematics in Grades I through VI

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Summaries, Yearbooks, Bibliographies

TWO SUMMARIES OF RESEARCH, not merely for the past few years but from the earliest to recent studies, were printed. The one by Buswell (35) is practical in nature and is intended to give teachers brief answers to some of their most pressing problems. Altogether eighteen questions were asked and were considered in the light of research but without specific citations, each in approximately a page. Wilson's summary (134) is much more extended (about 10,000 words). Its purpose is to show what research in arithmetic "adds up to," not alone for the teacher but for the student of the curriculum and of research methodology as well. A list of 115 references, all of which are cited in the body of the chapter, concludes the report.

Buswell continued his practice of supplying short annotated bibliographies covering some of the research studies for the preceding years (36). The five latest in this series of selected bibliographies, 1937 to 1941 inclusive, average about eighteen references a year.

The National Committee on Arithmetic of the National Council of Teachers of Mathematics published its final report, *Arithmetic in General Education* (77). Besides the Introduction by the chairman, Morton, who in 1938 had stated the Committee's point of view in arithmetic (73), this yearbook contains fourteen chapters. Two of the chapters are bibliographies. Stretch (102) listed one hundred carefully chosen research studies, and Bond (9) one hundred critical, theoretical, and practical articles. Wren's chapter (141) consists of 168 questions addressed to teachers and designed, not for the purpose of self-evaluation, but as "shockers" to dispel self-complacency on their part. Other chapters in this yearbook which are pertinent to the topics of the present summary but which are not referred to elsewhere are those by Brownell and Grossnickle (18), "Interpretation of Research"; by Buckingham (31), "What Becomes of Drill?"; and by Buswell (34), "The Function of Subject Matter in Relation to Personality." The last named reference is particularly important since it refutes (but in a positive way) the commonly heard charge that the mastery of subjectmatter in general and of arithmetic in particular is inimical to a well-adjusted personality.

Studies in Arithmetic by the Scottish Council for Research in Education (93) is composed of six excellent researches, which will be considered later in this chapter. Brownell (19) prepared a critical synthesis of printed investigations relating to arithmetic in Grades I and II. Chapter 2 of that monograph brings together studies on the number

abilities of children upon entering school, and Chapter 4 similarly canvasses results of instructional studies in these same grades. Smith and Eaton (98) published an elaborate summary of research on the teaching of arithmetic to pupils of low ability. Their bibliography contains 707 references, many of which are only remotely connected with the subject of their study.

State Courses of Study

According to the *Education Index* the following states published new courses of study during the period here under review: Idaho (62), Kansas (68), New Mexico (79), Oregon (80), and Pennsylvania (82). The last-named course of study was explained and defended by Stadlander (101), who compared its theory and placement of topics with various textbooks.

Sample Theoretical Articles on the Curriculum

The present and changing function of arithmetic in the elementary curriculum was valuably discussed by several writers; for example, by Breed (12), by Buckingham (30), and by Suelztz (105). In two other important references Buckingham treated the contribution of arithmetic to general education (28) and differences between meaning, significance, and insight as arithmetical outcomes (29). Brueckner (25) emphasized social phases of arithmetic instruction, and Tingley (112) urged the adoption of an arithmetical system with eight instead of ten as the base. Wilson (138) objected to the attempt to derive the arithmetic curriculum or methods of teaching from any so-called "theory" regarding the subject.

Determination of Content (Learning Experiences) through Surveys of Adult Usage and Adult Opinion

Johnson (66) circularized 650 manufacturers, doctors, engineers, and educators to ascertain their opinions with respect to instruction in the metric system. Eighty percent favored general adoption and exclusive use of the metric system; 75 percent felt that the change could be made rather easily over a short period of years and should be effected through education rather than through governmental action alone.

Wilson (138) summarized four master's theses relating to denominate numbers and measures. Three of the studies surveyed the use of such concepts in important industries (silversmithing, jewelry, textile finishing, department store, etc.). The results agreed in showing that comparatively few measures taught in school are used in the trades sampled. The fourth investigation was made with four groups of several hundred subjects each, from grade children to adults, and involved a test to determine the measures known to, and used by, various age and regional classes. It was concluded that measures taught in school are for the most

part forgotten if they are not used and that most people use only a few denominate measures, namely, those in their common experience. It was further concluded that, except for informational purposes as contrasted with computation practice, the instructional load in denominate numbers and measures should be drastically reduced.

Determination of Content through Studies of Children's Knowledge, Uses, Needs, and Interests

Willey (133) summarized in convenient form the principal earlier studies on number knowledge of children entering school, together with more recent investigations relating to their arithmetic uses, needs, and interests. Eight other original studies, part of them covered in Willey's summary, appeared during the period here under review.

Three of the eight studies are inventories of number knowledge. Grant (52) administered Test 5, "Numbers," of the Metropolitan Readiness Tests to first-grade children and reported his data separately for children of low IQ (below 90, N-145), of average IQ (90 to 109, N-252), and of high IQ (110 and above, N-161). The tests included a wide variety of information and skills relating to arithmetic. A similar survey of number knowledge of school entrants was made by Brownell (20) who employed both written tests and individual interviews. New data are combined with comparable data from previously printed studies. Both the Grant and the Brownell studies confirmed the earlier published conclusion that children entering school already possess a large number of quantitative ideas and skills. The significance of such data for instruction is open to question. In Whiteaker's opinion (130) the data do not mean that children may be expected to take on further learnings with economy and ease. Whiteaker's doubts were somewhat refuted by Gunderson's findings (61) in the last of the three inventory studies. Gunderson showed that after a year and a half of experiences carefully planned to develop new meanings and skills her pupils made extensive gains in knowledge and skills.

Five studies were made of ways in which grade children employ arithmetic in out-of-school relationships. Moseley (74) had three groups of sixth-grade children keep "arithmetic diaries." Culver (39) had parents record all their children's questions, problems, and comments regarding quantity and supplemented the data so obtained by more than one hundred visits to homes. Her subjects were aged six to ten. Robinson's investigation (86) also involved arithmetic in the home, as reported by parents. Ellsworth's subjects (47) were children in Grades III to VI, who themselves reported the number of times they used arithmetic and the ways in which they used it each day. Willey's data (132) were obtained in the classroom, from teachers, but had to do with arithmetic outside the regular arithmetic period. The grades included were kindergarten through Grade VI. The findings obtained by Ellsworth will be cited as illustrative

of the findings: of the 53,163 uses reported by his subjects, 27 percent had to do with telling time, 16 percent with using money, 14 percent with counting, 13 percent with reading numbers, 8 percent each with writing numbers and with Roman numerals, 5 percent with addition of whole numbers, 2 percent with subtraction, 1 percent with multiplication, 0.3 percent with division, and so on. In all studies the skills used were found to be simple; fractions seldom appeared; practical measurements were common.

Organization of the Curriculum

In spite of the great interest in the organization of the arithmetic curriculum as revealed by current discussion and by numerous theoretical and practical articles, exceedingly few research studies were reported in this area. The reason may lie, in part, in the ambiguity of terminology. Practically all teachers and students of arithmetic want learning experiences to be "meaningful." But what is a "meaningful" learning experience or curriculum? Johnson (67) described steps taken in revising the Chicago course of study to insure a "meaningful curriculum." Wheat (124) analyzed Johnson's description and concluded that this curriculum could not be "meaningful," and that the means adopted to produce this course of study in themselves must inevitably be inadequate. Similarly, there is little agreement as to what constitutes an "incidental" approach to arithmetic. Buswell (33) analyzed the report of the Benezet (Manchester, N. H.) experiment on "incidental" organization and found the course there to have contained much arithmetic that was taught systematically. Thiele (110), after a visit to the Manchester schools, came to the same conclusion.

Current practices in several "progressive" schools were outlined in one article (85). Samples of units having social emphasis follow. Tompkins and Stokes (113) told how thirteen eight-year-old children learned about the supplying of Philadelphia's food needs. Schaeffer (90) described a particularly good informational unit on time for Grade IV. A unit for Grade V on the ordering and distribution of milk was reported by Welch and Shibles (123); one for Grade VI involving the school newspaper, by Lane (69); and one for Grade VIII on personal accounts, stocks and bonds, and railroads by Russell (87). The reports of Tompkins and Stokes and of Russell are especially helpful in showing the arithmetic actually used in the units.

One investigation (20, Chapter 4) dealt with results of systematic instruction in Grades I and II—instruction oriented with respect to mathematical phases instead of social phases of arithmetic. Rather complete measures were obtained for outcomes relating to number concepts, number combinations, computation, and mathematical understanding, and less complete measures for outcomes of a social character.

Readiness and Grade Placement

Several suggestive articles with respect to grade placement appeared (for example, 21, 33, 43, 103, 104, 140). Brownell (16) briefly summarized and criticized research on readiness under three headings: first-grade inventories, evaluation by testing, and control-group experiments. Brueckner's longer review (22) concluded with a bibliography of fifty-one titles and made several important recommendations.

The outstanding work on grade placement over a period of years has been done by the Committee of Seven, whose experimental procedures and general position with regard to grade placement are well known. The chairman of the Committee, Washburne, summarized the work of his group (119), at the same time proposing standards for the placement of several new topics. The bibliography of thirty-five titles presumably contains all important articles which up to that time had been written by the Committee, by its supporters, and by its critics. In another article (120) standards for placement (really mental age placement) of time and of linear and square measure were reported.

Brownell (14) vigorously attacked both the experimentation and the practical consequences of the Committee of Seven's work. He listed the seven experimental weaknesses admitted by the Committee and then developed two of these in detail in order to show the limitations they impose upon the general adoption of the Committee's standards. He also deprecated the effect of the Committee's research and writings in discouraging constructive efforts to create readiness and in distracting research interest from the study of learning to the less vital problem of placement. Washburne (119) replied to the criticisms with equal vigor. The two articles should be read together.

Johnson (64) reported briefly the effect of Chicago's adoption of the Committee of Seven's placement standards after a few years' trial. In general, marked improvement in pupil achievement resulted. Whether this same improvement might not have been accomplished without the postponement of topics and through the introduction of better methods of teaching, diagnosis, and remedial instruction is not considered. That this possibility is not fantastic was shown by Grossnickle (57) who, in retabulating data previously published by him and criticized by Washburne (119), confirmed his conclusion that under a program of carefully controlled instruction and diagnostic and remedial measures, children can learn division with two-figure divisors sixteen months short of the Committee of Seven's standard of twelve years seven months of mental age.

Brueckner and Melbye (26) analyzed test data to reveal that division by two-figure divisors cannot properly be regarded as a single process to be located for instruction at some one point in the grades. Division examples in which the apparent quotient figure is not the true figure were on the average 39 percent more difficult in Grade VB than examples in

which the apparent figure was the true figure, and in Grade VIA were 23 percent more difficult. Extreme variability in difficulty characterized subtypes as well.

Newman's comparative figures on time allotment for instruction in Scottish and American schools (78) are of special interest to readers of MacGregor's earlier report.¹ MacGregor showed that Scottish children who begin arithmetic at age five instead of six maintain their year's advantage (even add slightly to it) when tested six years later by unfamiliar and ill-adapted American standard tests. According to Newman, Scottish children in the seven years of their primary school have about 8 percent more hours of instruction than do American children in their eight years of elementary education. Another Scottish study, by Curr (40), dealt with placement of "long" division. Curr pointed out the defect of arbitrary mental age standards, showing that with a given mastery standard of 83 percent the minimum mental age for certain examples with divisors of 2 to 12 varied as much as two years. With divisors of 13 to 99 and a 56 percent mastery standard the minimum mental age varied from 10 years 5 months to 17 years 7 months. In view of the extreme interest at present in grade placement, five of Curr's conclusions are paraphrased:

1. For purposes of placement the minimum mental age recommended for a topic is of secondary importance; the chief aim is to determine whether postponement improves or diminishes efficiency of learning.

2. The present study, by using the Committee of Seven's general statistical techniques, confirmed that committee's conclusion that mentally older starters learn better, but

3. The foundations score is a better index of success than the mental age at which the topic is begun, and

4. The reason why the mentally older starters learn better is to be found in their higher IQ's.

5. Over the range of mental ages at which topics are really taught postponement probably makes little difference to learning efficiency, though there is below that range a mental age short of which it cannot be efficiently learned.

Studies of relative difficulty of the processes in terms of their sequence in verbal problems were made by Berglund-Gray (5), by Berglund-Gray and Young (6), by Young and McIsaac (142).

Readiness tests—Gunderson (60) described certain informal readiness tests for primary grades. Brueckner (23) announced the publication of a series of readiness tests eventually to measure the ability of children to attack many new topics in arithmetic. The purpose of the tests is diagnostic rather than purely predictive, in order to enable the teacher to build up essential skills before introducing a new topic. The test for division with two-figure divisors was described, and data were presented to show its validity and usefulness.

¹ MacGregor, Gregor. *Achievement Tests in the Primary School*. London: University of London Press, 1934

Theoretical and Practical Articles on Teaching Methods

Anderson (1), Brownell (17), and McConnell (70) wrote on the newer views of learning as it relates to arithmetic. Three chapters of the yearbook of the National Council of Teachers of Mathematics were devoted primarily to matters of method, namely, the chapters by Thiele (106), who discussed instruction in the lower grades from the point of view of number inter-relationship; by Wheat (126), who dealt with instruction in the middle grades, again from the mathematical point of view; and by Sauble (88), who provided a large number of practical suggestions for enriching the arithmetic course. Polkinghorne (83) compiled a number of brief articles relating to arithmetic instruction in the primary grades, and Bond (9) showed how teaching in other grades as well could be improved through the development of meanings.

Noncomparative Studies of Particular Devices and Technics

In the studies summarized in this section some particular device, technic, or what not was employed with a group of children, and the effects of its use were observed. The reports contain informal accounts, with or without supporting quantitative data, which attest the value of the device. Absence of comparative data makes it impossible to establish the relative merits of the device or technics as compared with alternative procedures.

Dickey (42) described a unique visual aid for the teaching of division by fractions. While he presented no quantitative data to prove its worth, the claims made for it seem reasonable and should stimulate trials by other teachers. Betts (8) reported inconclusive evidence from a study in the sixth grade in which calculating machines were used to stimulate improvement both in computation and in problem-solving. Mackay (71) undertook to test the value of teaching zero as a placeholder instead of as a number.

The advantage of teaching children methods of self-instruction was demonstrated by Wheat and his students. Wilburn (131) taught the easier addition and subtraction combinations to seventy-two children with a mean age of six years and ten months, all enrolled in Grade I in small schools. Forty-seven percent of the children learned all forty-five combinations. Wheat (125) included the Wilburn study with five others which involved the multiplication and division combinations, all taught by methods which encouraged children to discover relationships, arrive at answers, and test answers on the basis of self-responsibility. Achievement in each case seemed to be high.

Wheeler (127, 128, 129) made use of his games (Count-0, Add-0, Mult-0) in order to teach children to read, add, and multiply numbers. Data from the last two studies were utilized to determine the relative difficulty of the combinations but served merely to demonstrate once more

the dependence of difficulty ratings upon methods of teaching. The value of his three studies for instructional theory is reduced by the fact that only a drill type of teaching, happily now on the wane, was employed. An excellent contrast in instructional procedure is offered by Spitzer and Dunfee (100), who described methods to teach meaningfully the division and multiplication facts.

Comparative Studies of Devices and Technics

In seven investigations check groups or other statistical or experimental controls were used in order to compare the advantages of the device or technic in question with those of alternative devices and technics.

Long division—Grossnickle's procedure (56) was analytical and statistical. He compared the advantages of two methods of estimating quotient figures in examples with three-place divisors, namely, the apparent method and the increase-by-one method, and found no advantage for either method. He advised teaching only the apparent method in order to forestall the troublesome decision as to whether the guide figures of the divisor should be increased or not.

Subtraction—Two investigators found experimental evidence in favor of the equal additions method of subtraction. Johnson (65), who had reported several earlier studies of the problem and with similar results, compared the method of equal additions (E) with the method of decomposition (D) and the so-called "Austrian" method (A). In the example 81—47, one thinks, according to method E, "7 from 11 are 4; 5 from 8 are 3"; according to method D, "7 from 11 are 4; 4 from 7 are 3"; according to method A, "7 and 4 are 11; 5 and 3 are 8." Johnson tested in all, 342 children in Grades III to VIII who used method E, 526 who used method D, and 186 who used method A. No difference in time or errors was observable among the three groups on the simple subtraction facts. On harder examples, however, group E surpassed group D in accuracy by a statistically reliable amount and surpassed group A by an amount not quite reliable. As for time, the D group took 16 percent longer than group E and 67 percent more time than group A. When time comparisons were restricted to subjects who made no errors at all on the simple facts, groups E and A maintained their advantages over group D. Unfortunately, Johnson did not report his data differentially by grades. On this account students of arithmetic who concede the greater final efficiency made possible by equal additions but who are concerned that whatever method is taught must be taught in a way which makes the process sensible to learners—such students will remain unconvinced by Johnson's data that the initial method of instruction (Grade III) must be that of equal additions.

Murray's study (75) of subtraction methods comes closer to providing the needed evidence at this point. In his "junior" group, aged eight and nine, were 464 pupils who had been taught the method of decomposition

(D), 842 the method of equal conditions (E), and 316 the "complementary" method (C), according to which in the example 81—47 one thinks, "7 and 4 are 11; 4 and 3 are 7." (This last method is therefore unlike Johnson's method A.) Since "borrowing" in subtraction is taught in Scottish schools at ages seven and eight (93, p. 216), the junior group in Murray's study was but one year removed from initial learning. His "senior" group, aged ten and eleven, was made up of 566 users of method D, 835 users of method E, and 274 users of method C. Elaborate statistical treatment revealed that, in all comparisons, both for accuracy and for speed, method E proved most efficient, method C also being superior to method D though not reliably so.

Subtraction provided the basis for a third experiment, in which the method of decomposition alone was taught the subjects, to determine whether a certain "crutch" aided or hindered learning. The results were reported in full by Brownell in a monograph (20) and briefly in a shorter article (13). The crutch was designed to help children understand the nature of borrowing and was found, by a variety of measures, to increase ease and efficiency in learning not only for the duller children and those least capable in arithmetic but also for the brightest and the most capable as well. Most children tended to abandon the device when they no longer needed it, but the crutch was found useful later on in certain situations, when it was revived—situations in which the child was mastering a new complex task involving subtraction or regaining subtraction skill after a period of disuse. The last chapter of the monograph discusses the significance of the study for learning theory and for arithmetic instruction in general.

Addition—Thiele's investigation (108) related to the teaching of the 100 simple addition combinations by two different methods, the drill method (D) and the generalization method (G). The 270 D subjects were taught each combination directly, separately, and with the attempt to prevent the discovery of relationships. The 242 G subjects, on the other hand, were encouraged to note relationships, to group facts according to generalizations, and to use the generalizations in learning and in correcting errors. The D group was slightly inferior in intelligence to the G group (48 percent as compared with 57 percent had IQ's of 105 or better), but held a slight advantage in knowledge of the combinations at the start of the experiment. On the end test the G children clearly excelled the D children in number of combinations known, regardless of intelligence level and ability to extend their number knowledge to the addition of one- and two-place numbers as well as the addition of two two-place numbers. The advantage of the G method is actually greater than claimed, for the D group had two opportunities to recognize and utilize meanings which are not usually part of the drill procedure of teaching: (a) the readiness program given both groups of children must almost necessarily have made the D children aware of number relationships, and

(b) the combinations were grouped in ways which could have disclosed to the D children the principle that the order of addends (as in direct and reverse combinations) in no way affects their sum.

Problem-solving—Thiele (108) also compared three different methods of teaching children to solve problems: (a) the "association method," according to which children when in difficulty consulted "type" or "model" solutions and corrected their errors with a minimum of help; (b) the "analysis method," in which problems were to be studied in the light of the usual questions, "What is given?" "What is to be found?" and "Which is the correct solution?" and (c) the "vocabulary method," in which the subjects selected from several suggested words the ones needed to make sensible problems for the facts given. A total of 182 trios of fourth-grade subjects were available for comparisons after fifteen weeks, ten minutes a day, spent on the same sets of problem exercises. The "association" group surpassed both the other groups by reliable differences. The conclusion is drawn that it is far better to give children plenty of experience in problem-solving by their own devices than to impose upon them artificial procedures which they cannot understand or use effectively.

Problem-solving was investigated in a different way by Bramhall (11), who was interested in the comparative merits of "conventional" as compared with "imaginative" problems. Seven classes (213 children) spent three class periods a week on imaginative problems, solving them in any way they wished, while the same number of classes (214 children) spent their time entirely on conventional problems. Wheat's earlier study found that children were more successful with the conventional type; Myers' study, with the imaginative type. Bramhall could find no difference in the results of exclusive training with either kind, his measurements being made after ten weeks with several different standard tests.

Diagnosis and Remedial Instruction

Brueckner (23) showed that much research in diagnosing and predicting handicaps in learning may be grouped under four headings: (a) studies in the field of readiness; (b) studies of characteristics of those whose achievement is good or poor; (c) studies of more effective organization and gradation of curriculum content; and (d) studies dealing with the ways in which learning takes place at various stages of the learning process. Samples of these four kinds of study are, in order, 29, 66, 13, and 25.

An important phase of a program of diagnostic and remedial instruction consists in providing proper measures to prevent the operation of factors harmful to learning. Myers (76) and Washburne (118) both stressed the need for greater emphasis on prevention instead of correction of error. Brueckner's readiness tests (24) for this purpose have already been mentioned.

All studies which reported the effectiveness of diagnostic and remedial instruction dealt with the computational phase of number. Moreover, none

of them measured the amount of meaning or understanding which accrues from programs of remedial instruction. Brownell (15) illustrated the kinds of measures which might be secured for this purpose.

Diagnosis of particular difficulties in a given process, followed by remedial instruction, is effective in producing higher scores on an achievement test in that process. Becker's twenty-two sixth-grade children (4) had fewer errors in adding fractions after diagnosis and instruction. Jacqueline (63) obtained similar results from diagnosis and remedial instruction with seventh-grade pupils in fundamental operations, principles of percentage, and problem-solving. A growth in sense of personal responsibility for success and failure in work was claimed. In another experimental group of seventh-grade pupils who had shown weakness on a given unit in arithmetic, Thompson (111) supplied remedial work on needed parts during 10 weeks with approximately a year's gain.

Diagnostic testing devices—Appraisals of various diagnostic tests were collected by Buros (32). Schonell (92) outlined the use of certain diagnostic tests for integers in the four basic operations. Smith and Eaton (96) described a mechanical process for exposing basic combinations to pupils. This device was used in diagnosing errors of seventy-seven fourth-grade pupils. A dictaphone record of the thought processes of the five poorest pupils in working an example was played to each pupil so that he could discover his errors. Eaton (45) discussed the value of the dictaphone record for correcting deficiencies in computation.

Dahle (41) secured repeated elaborate measurements by means of motion pictures, the Iowa Oral Language machine, and a psychogalvanometer from sixteen fourth-grade children at critical stages while learning long division. Important diagnostic values were claimed for the measures, particularly because of their unusual comprehensiveness.

Wilson (135) showed the danger of assuming that all standard tests which seem to have the same function are actually alike, and Brownell (15) discussed the general problem of evaluation of learning, illustrating some of the newer technics.

Error Studies

Shane (91), experimenting with 274 pupils in Grades VI-VIII, found no particular type of error to be characteristic of any mental level. Schonell (92) outlined the kinds of error encountered for each process in arithmetic. Gardner (49) analyzed kinds of errors made by Scottish children in dealing with fractions and compared the number of errors made by American children on the same test. In each of four processes with fractions, the American children made more errors. Thyne (114) analyzed errors made by pupils in the primary grades in connection with the basic facts and found that 65 percent of the multiplication errors resulted from the presence of zero.

The four kinds of examples in division of decimals are (a) dividing a decimal by an integer, (b) dividing two integers with a decimal in the quotient, (c) dividing an integer by a decimal, and (d) dividing a decimal by a decimal. Grossnickle (58) gave a test to about 200 pupils each in Grades VI-IX inclusive and found that type (c) is much more difficult than any of the other types (it being responsible for 45 percent of all incorrect examples) and that placement of the decimal point in the quotient is the most difficult step in the division of decimals.

Constancy of error—An error is constant if it persists; otherwise it is due to chance or a lapse of some kind. Grossnickle and Snyder (59) concluded that all errors on the basic facts, except on zero combinations, were due to chance. Their data being drawn from the records of about 100 pupils per grade, Grades IV-VIII inclusive, who five times took the same tests on the facts for the different operations. The number of constant errors was found to be small also in the case of division with two-figure divisors (54). Grossnickle's 221 pupils made 113 different kinds of errors, the average number per pupil being nine during a learning period of twenty-six practices. Furthermore, constancy of error was no more characteristic of pupils who achieved poorly in school than of pupils who did well (57).

Textbook and Vocabulary Analyses

That "mathematics is a mirror of civilization" was shown by Schaaf (89), who made a qualitative analysis of the contemporary social conditions in arithmetic textbooks of an earlier time. In his comparison of eight textbook series, Ulrich (115) discovered considerable agreement among authors as to placement of the basic number combinations and reasonable agreement in the placement of fractions but wide variations with regard to percentage and its applications.

The number of different words and their average number of repetitions were studied for five third-grade textbooks by O'Rourke and Mead (81). About 55 percent of the 296 arithmetical words found appeared five or fewer times, and 24 percent appeared only once in the books in which they were used. Andreen (2) reported that only a few arithmetic workbooks can be characterized as self-administering materials. Waterman (122) offered suggestions for rating textbooks in arithmetic.

Gorman's figures (51) showed that elementary-teachers-in-training need specific instructions on the vocabulary of arithmetic, and Porter (84) gave an altered and condensed form of the Buswell-John Vocabulary Test to Scottish children. Bertotti (7) reported that only 1 percent of the words in six consecutive issues of the *Reader's Digest* were mathematical in character and that about 70 percent of these words appeared in the Dolch list for Grades V-VIII.

Home Study

Further doubt has been cast on the values of home study by four investigations. However, the measures used relate alone to arithmetical outcomes and not to other possible values such as the development of habits of independent work. The study by Crawford and Carmichael (38) was made in Grades V-VIII, that by DiNapoli (44) in Grades V and VII, that by Foran and Weber (48) in Grade VII, and that by Vincent (116) in Grades VI and VII. The results obtained by Crawford and Carmichael are probably typical: a three-year average of home-study classes in one school was 7.43 in arithmetic reasoning and 7.73 in computation, both measures from the New Stanford Achievement Test; the corresponding three-year averages without home study were 7.10 and 8.03.

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CHAPTER V

Teaching of Mathematics in Grades VII, VIII, and IX

FOSTER E. GROSSNICKLE

Curriculum for Grades VII-IX

COMPREHENSIVE OUTLINES of the work for Grades VII, VIII, and IX given in the Fifteenth Yearbook (45). The work for Grades VII and is predominantly arithmetic. The work in the ninth grade in one curriculum plan is general mathematics with emphasis on the social applications of number. In the other plan the core of the curriculum is algebra, with material from arithmetic, graphic representation, and geometry. McCamey (36) analyzed fifty-three city and state courses recently published since 1929 to determine the type of mathematics offered in the ninth grade. She found that two-thirds of the courses were conventional and one-third "reorganized" mathematics; nine cases were both. Half of the courses gave general objectives but did not tell how these objectives were obtained. In general, ninth-grade mathematics was predominantly algebra. Even in reorganized courses, more algebra was taught than all of the other subjects combined.

Turner (59) sought to ascertain by means of a questionnaire (a) what factors affect pupils' liking for mathematics; (b) what types of mathematics are of most value for carrying on different activities; and (c) how allotments for various topics compare with the use and value of those topics in the lives of the pupils. Turner concluded that much of the content matter of the eighth-grade course in mathematics is beyond the understanding of the average pupil and that it appears in the curriculum as a matter of faith in some vague and indefinite future use.

Worries (23), Jahn (31), and Murray and Ritchie (42) set forth objectives for junior high-school mathematics. Drake (18) reported a project in teaching statistics in the ninth grade. He found that it is feasible to teach concepts of central tendency and percentiles.

Willory (38) tested the relative difficulty of certain topics in mathematics for the slow-moving pupil at the ninth-grade level. The topics included in the curriculum which he constructed were selected not with a view to satisfactory pupil achievement but simply to determine which types of work most interested the pupils, and which algebra and intuitive geometry types they could do most successfully. In general he found that pupils with low IQ's were deficient in arithmetic computation. Low IQ did not prove a handicap in most intuitive geometry but it was a handicap in situations which called for more precise reasoning and formalization. Simple equations and signed numbers were easily learned in algebra, but making and evaluating formulas and using general numbers

in fundamental operations were learned with more difficulty. He found that his experimental subjects did not like and could not succeed with demonstrative geometry in the ninth grade.

Leete (35) selected basic principles governing the operations of fractions so as to avoid many of the most common pupil errors. She noted the parallel between arithmetic and algebraic computation for fractions. Short (53) showed how to correlate arithmetic and algebra, and Murtaugh (43) showed how to make factoring meaningful in algebra by calling attention to its applications in arithmetic.

Denominate numbers—Washburne (62) reported for the Committee of Seven the grade placement for teaching certain measures. The placement was determined by finding the mental age at which 75 percent of the class retained the subject with 80 percent accuracy. He found that it is not until a pupil reaches a mental age of approximately fourteen years that the fundamental operations may be performed effectively on denominate numbers.

Approximate Computation

Boyer (6) gave rules governing the operation of approximate computation. Solomon (55) took issue with conventional rules and set up his own principles. Bakst (2) gave the mathematical theory underlying this phase of number. Shuster (54) showed how approximate numbers have practical usage in connection with operations on a slide rule. West and Shuster (64) stated the conventional rules for operating with approximate numbers and concluded that such operations should be taught in the elementary school (upper grades) because (a) they are the only "real life" computation for practical purposes; (b) they give a definite criterion for rounding off numbers and for determining how far to carry out a problem in division, an equation, or square root; (c) they eliminate ragged decimals in addition and subtraction; (d) they prepare a pupil for approximate methods such as those with logarithms and the slide rule. A stimulating discussion of approximation was found in the Report of the Committee on the Function of Mathematics in General Education (48).

Achievement in Arithmetic

How does the arithmetic achievement of pupils today compare with that of a generation ago? Boss (5) investigated this question by comparing pupil achievement on a survey test in arithmetic in St. Louis in 1938 with results from the same test in 1916. The median scores for the 1916 group were higher than the median scores for the pupils of today. The author thought the difference to be due to shifting of topics in grades and to the increased holding power of today's schools. In the earlier period, many failing pupils were eliminated before the eighth grade. Grossnickle (24)

found that the achievement of ninth-grade students in division of decimals was much less than the achievement of those in Grades VII and VIII. Studying about 200 students in each grade, he found that placement of the point and not the division operation is the chief element of difficulty.

Christofferson (14) reported the results from "Every-Pupil Tests" in Ohio for Grades VII and VIII. On the whole, achievement in computational skill was found satisfactory. Ability to solve problems as revealed by these tests seemed different. The writer concluded that students come to junior high school inadequate in ability to think through quantitative situations, and they leave at the end of the eighth or ninth grade deficient in ability to utilize their skills in solving problems.

Thompson (58) reported diagnostic testing over a period of three years, of 38 students in Grades VII, VIII, and IX, and concluded that diagnosis and remedial instruction are effective. Braverman (7) tested 460 students in the ninth year to see the effect of algebra on their arithmetic scores. In most cases the arithmetic scores were improved, though the difference in means was not statistically significant.

Factors Affecting Achievement in Algebra

Lahey (33) studied a group of 229 ninth-grade students to determine (a) the amount of algebra retained after a year of studying geometry; (b) differences in retention of algebraic computation ability and problem-solving ability; (c) the effect of intelligence on this difference; and (d) sex differences in retention. The results showed (a) loss of about 20 percent during the first eight months, with little further loss; (b) a 10 percent gain in problem-solving ability; (c) a positive but low correlation between IQ and retention in fundamentals; and (d) no statistically significant difference between the average scores of the two sexes.

Effect of vocabulary and reading ability—In a matched group experiment Drake (19) found that teaching the vocabulary of algebra appreciably increased the student's achievement in the subject. Buckingham (11) found a statistically significant correlation between total scores in vocabulary and total scores in algebra.

Stright (57) investigated the effect that specific training in reading and efficient methods of study had upon ninth-grade students' reading ability and skill in solving problems in algebra. The parallel group method of experimentation was used. In reading and in problem solving, there was a statistically significant difference between the means for the experimental group and for the control group. The writer concluded that a better knowledge of reading mechanics increases a student's reading comprehension and affects his ability to solve algebraic problems. Clark (15) found that intensive training in reading resulted in a gain in algebraic achievement. Buckingham (10) found positive correlations between algebraic achievement and various types of reading scores, most of them below .40.

Measurement and Prediction

Hastings (27) made a test to measure mathematical concepts in the junior high school. He used six different testing devices. He concluded that no single technic or testing device, such as a multiple-choice test, is a sufficient index of the behaviors measured by all the other types of tests. On the basis of his finding, he drew up a concrete plan for testing mathematical concepts. Seder (52) made an objective test which contained some arithmetic, simple algebra, and elementary geometry to measure a pupil's achievement in a reorganized course in mathematics in Grades VII, VIII, and IX. There are three forms of the test, each containing 130 multiple-choice items requiring 80 minutes working time.

Prognosis—From the records of 214 eighth- and ninth-grade students, Clifton (16) formed a prediction equation from scores on the New Stanford Achievement Test, chronological age, and mental age. He was able to predict the mean grade for a class with considerable accuracy but not an individual grade. Dunn (21) tested 223 boys and girls in junior high school in ninth-grade algebra. Each pupil was given two standardized tests in arithmetic, two in algebra, and one for mental ability. A careful statistical study seemed to indicate that the teacher factor is influential in determining the correlation between achievement in algebra and the various predictive criteria taken separately and in combinations.

Seagow (51) studied 121 pupils in the seventh, eighth, and ninth grades, and found that either the Orleans Prognosis Test in Algebra or an arithmetic achievement test would yield a better prognosis of algebra accomplishment than an intelligence test would. He noted that the total test picture modified by subjective estimates of personal factors in the pupil affords a better indication of success than does any single test alone. Layton (34) found that eighth-grade mathematics marks gave a better basis for prognosis than did any other one factor that he studied.

Mathematics Equipment, Textbooks, and Other Instructional Aids

Many kinds of instruments and other pieces of equipment for the modern mathematics classroom are listed in the Fifteenth Yearbook (44). Bedford (3) drew up a list of about 150 articles for equipping a classroom to teach arithmetic through the first eight grades. Woodring and Sanford (65) also suggested certain types of equipment for the mathematics classroom and gave the places where they might be purchased. Ullsvik (60) gave a detailed list of new materials and equipment for teaching arithmetic, and of research periodicals and other publications dealing with teaching mathematics and with visual aids. Starr (56) gave a helpful bibliography of textbooks and materials for enriching a course in algebra. Mahachek (37) showed how certain pieces of equipment may be used in the mathematics classroom. Garner (22) described a score card to use for selecting a mathematics textbook at the junior high-school level. Hildebrandt (30)

cataloged a list of films available for vitalizing the teaching of mathematics. Russell (49) illustrated how pictures may be used to teach mathematical concepts.

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CHAPTER VI

Teaching of Science in Senior High School and Junior College

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SINCE TEACHER EDUCATION and historical studies are dealt with elsewhere, the subjects included here may be assigned to two general categories: (a) those relating primarily to the curriculum, and (b) those having to do with the learning process. A number of investigations sought to determine the status quo with respect to courses taught, pupil enrolments, equipment, and similar matters. Attention was also given to the selection of new content for courses, especially in the area of conservation education. New courses such as senior science and survey courses were analyzed. In the area of evaluation, the tendency to go beyond factual information in measuring outcomes was evident. Changes in attitude, in overt behavior, and in understanding were emphasized.

Offerings in Science

An extensive questionnaire study was made by Riddle, Fitzpatrick, Glass, Gruenberg, Miller, and Sinnott (56) in an effort to reveal the extent and nature of the biology program in secondary schools. Questionnaires were filled in by 3,186 biology teachers, representing all areas of the United States. It is admitted that the responding group probably was selected to some extent, and that the data therefore indicate a situation somewhat better than the one that actually exists. Findings of special interest were:

1. Biology teachers often teach other subjects, which are usually in the field of science. Nonscience subjects most frequently taught were history, English, and agriculture.
2. Teachers who also gave instructions in general science estimated the amount of biological subjectmatter contained therein to range from 20 percent to 30 percent.
3. A national average of 28 pupils per biology class and an average pupil load (per teacher) of 124 were reported. In cities of more than 100,000 population, more than half of the biology classes contained more than 35 pupils. The pupil load per teacher was also higher in large cities than in rural areas.
4. Equipment and conditions under which teachers work are not very satisfactory. This is particularly true in town and rural districts; rural schools of the South and of New England reported relatively poor equipment and facilities.
5. Promotion of biology teachers is largely influenced by success in teaching and length of service. Politics, prejudice, and favoritism were reported to play but a minor role.
6. The amount of biological instruction varies greatly in different parts of the country. Substitution of social studies for biology was reported as a recent event in about 10 percent of schools, the larger cities leading this movement. Hygiene courses had been transferred to physical education in about 20 percent of the schools. There was consid-

erable indication that many teachers presented biology as the learning of engaging hobbies, or as an aggregate of practical technologies.

7. About half of the teachers indicated that they taught the principle of organic evolution. Most of the teachers testified that they dealt with the genetic inequality of men, although in the case of parochial schools the percentage of such teachers was only 65.

Hunter and Spore (29) conducted a survey of secondary-school science offerings and enrolments, based partially upon questionnaire returns from some 665 schools and partially upon data from governmental sources. Weckstein (74) surveyed laboratory work in elementary biology, with special attention to objectives and learning experiences. Woodruff (78) analyzed the mathematics used in biology. Gerber (22) investigated the relative emphasis placed on science and social studies in secondary schools of Tennessee. The study gives further evidence that this balance is a matter of some concern to science educators. Loraine Hunter (30) reported on important biological problems of the southeastern region in relation to textbooks used and the extent to which these problems were actually considered. Kessler (36) analyzed thirty-five "popular" science books as to readability, difficulty, and general acceptability for use by tenth-grade biology pupils.

Reports on courses, personnel, and equipment of various high schools offering courses in chemistry and physics indicate that there is much room for improvement. Leach (42) made such a study for Pennsylvania, Chandler (12) for the colored schools of South Carolina, and Sister Gertrude Jose Smith (64) for the Catholic secondary schools of northern New Jersey. More analyses of similar nature might well be of value in the establishment of acceptable standards and in suggesting changes in curriculums.

Survey Courses in Science

It is evident from various reports that general courses in physical science are being offered with increased frequency, both in high schools and in colleges. Watson (71) reported this trend to be especially well marked in California, where 28 percent of the high schools offer such courses, as compared with 21 percent for cities in the country as a whole. About 28 percent of the undergraduate colleges of the country offer survey courses that deal with materials of the physical sciences. The basic question of whether the physical science survey course is more effective than the courses in physics and chemistry which it replaces was explored at the high-school level by Rosenlof and Wise (57), using 283 pupils paired on the bases of psychological examination scores, the Noll test of scientific attitude, and a devised informational test in physical science. The students in the survey course appeared to know more facts at the end of the year than did comparable pupils enrolled in chemistry or physics. Ferguson (18) explored two related questions: (a) the nature of general science

courses in the senior high school, and (b) how students of such courses compared with pupils of physics, chemistry, and biology on science tests. Clearly, more studies are needed in this area: specifically, we must be sure that all tests used are valid in terms of the objectives they purport to measure.

Meanwhile, evidence as to the effectiveness of survey courses in relation to retention was obtained by Freud and Cheronis (20) by readministering, a year later, the comprehensive test taken at the end of the course. The results corroborated earlier studies. Principles, theories, and applications were remembered somewhat better than were unrelated facts. Brewer (7) studied factors affecting achievement in a physical science survey course, and found that on the basis of final informational tests, students could be classified in significantly different groupings. These differed markedly from groupings based upon initial information, high-school preparation in science and mathematics, and intelligence. The effectiveness of a course in human biology for two quarters in preparing college students for courses in biochemistry, bacteriology, food preparation, and nutrition was compared with that of a course in zoology followed by a course in physiology, in a group of studies by Clara M. Brown (8). Studying the achievement of more than a thousand students, she concluded that comparable students with different backgrounds in science do not differ significantly in course achievement. This conclusion is in harmony with that of the Eight-Year Study (11), that the pattern of courses studied in high school is less useful for advising college entrance than is the pattern of abilities of the student.

Content of Science Courses

Wise (77) culled 252 science principles from earlier analyses and then set up criteria for selecting from eleven textbooks applications relevant to the principles. For 246 principles he found 3,153 applications. Gillson (23), as a basis for a chemistry course suited to pupil needs, analyzed letters written by former pupils, essay contest papers, questions sent to the Good Housekeeping Question Box, and returns to a questionnaire based upon the objectives of popular books and textbooks, and responded to by 400 laymen and 256 former students. She recommended differentiation of subjectmatter on the basis of sex, especially during the work of the second term, and a greater effort to teach chemistry in such a way that it will function in the lives of pupils. Showalter (62) found that diaries kept for three weeks by sixty-two adults in various walks of life indicated activities more relevant to some of the 183 chemical principles studied than to others.

P. G. Johnson (33) obtained the judgments of 240 science teachers (rural, elementary, and junior and senior high school), science supervisors, and leaders in science education with regard to course of study

materials. Testimony indicated that a looseleaf form, capable of being added to from time to time, was desired. Teachers indicated preference for separate organization of science subjectmatter based upon pupil needs and interests, divided into grade levels, emphasizing principles rather than facts, and including pupil activities and an annotated bibliography. Rural teachers favored an interchange of courses of study devised by teachers; supervisors and leaders in science education preferred a state course of study, possibly formulated with the cooperation of teachers.

Under the direction of S. R. Powers, the Bureau of Educational Research in Science (48) has defined major problems and has issued publications dealing with the impact of science on these problems. The areas in which source books especially useful to teachers are available include: national and world resources and problems of production (21); the community as an ecological unit (61); the control of organisms (19); genetic differences among people (24); and consumer education (9). Selected experiences of teachers who have dealt with these areas are reported in a series of "Suggestions for Teaching" (40, 41, 67). Several studies of changes in boys and girls whose learning has been related to these problem areas have been made in connection with the work of the Bureau (5, 43).

Conservation Education

Vessel (69) surveyed conservation education in rural areas; Quaintance (50) studied conservation education in schools and colleges. Capps (10) made a survey of the conservation information possessed by pupils in Missouri high schools. Webb (73) made an investigation dealing specifically with soil conservation, and one phase thereof represents a technic for determining relative emphasis that should presumably be given to different topics or understandings in selecting curriculum materials. The approach was to make a reading word list representative of soil conservation literature in popular books, magazine articles, bulletins, and newspapers. A survey of the possibilities of conservation education was published under the editorship of Ward (69). While not a report of research, this volume is no doubt destined to have desirable influence in modifying current programs of instruction. Kurtz (38), attempted to analyze the science information of farmers and prospective farmers in a Pennsylvania area. Most of the misconceptions held by these farmers proved to be of a technical nature.

Pupil Interests in Science

Among the more comprehensive and significant studies of interests were those made by Zim (79, 80, 81), who reported the use of various technics in an effort to ascertain the science interests of more than 3,200 high-school pupils. One approach was a questionnaire procedure in which subjects were asked what they would "like to find out best in science."

There was also a study of pupil responses to nine science exhibits. Another technic was represented by pupil expression of preference for films in a special fictitious list. In a further analysis pupils were asked to indicate science questions they had wondered about, using a prepared list as a basis. Exhibits submitted by junior high-school pupils to the Science and Engineering Fairs of the American Institute were also taken into account. In summarizing the data from such sources Zim (81) concluded, among other things, that "boys and girls show distinct differences in their interests and activities in biology," that such interests tend to be specific, and that they persist long enough to be of educational significance.

Administration of College Science Courses

Prerequisites—Wetzel (75) sent a questionnaire to chemistry professors in thirty-eight colleges. He found that one-third of the professors preferred students who have had high-school chemistry, and that 61 percent of the colleges offered separate courses for students having a background of high-school chemistry. Oakley (46) found that final test scores and final grades made by 89 freshman chemistry students who had taken high-school chemistry were superior to those of 89 paired students who had not had chemistry in high school. The analysis of scores on the Cooperative Physics Test for College Students made for the American Association of Physics Teachers showed that students with a high-school physics background were superior to the rest of the group both at the beginning of a course and at its conclusion. The scores also indicated that students who enrolled in courses having prerequisites showed no superiority over students in courses which had no prerequisites.

Speed-up of college programs—Administrators pondering the advisability of speeding up the teaching process in college science courses will be interested in Oakley's finding (46) that seventy-two college freshman chemistry students using a rapid, theoretical approach, showed superiority over matched students in a standard course. Clark (13) paired thirty-two students in an advanced freshman chemistry course with students who had also had high-school chemistry but were enrolled in an elementary chemistry course. In fourteen weeks the advanced course group gained as much as the others did in a semester. The report concerned with the use of the Cooperative Physics Test for College Students during the past six years showed that courses requiring more lecture and recitation time do not result in superior achievement; neither do courses carrying an unusually large number of credit points.

Outcomes: Attitudes, Critical Thinking, Misconceptions

The recognition of objectives in science teaching other than the acquisition of information, as represented in the period of the preceding review by Noll in the field of attitudes and Tyler in the area of critical thinking.

has continued. DeWitt (15) used data from the "Youth Expressionnaire" of the Character Education Institute to study differences in attitudes among three groups. One, composed of fifty college graduates who had studied science, had greater respect for accuracy, was more open-minded, was international-minded, and liberal from the religious standpoint. A comparable group of college graduates who had not studied science, however, was found to be no more superstitious. On the other hand, one hundred high-school graduates of comparable age proved to be relatively superstitious and conservative.

The Eight-Year Study (1) employed specially devised tests (63) such as "The Application of Principles of Science," "The Nature of Proof," and "The Interpretation of Data," to select the students recommended to colleges. The 1,475 students accepted from the "thirty schools" cooperating were matched with the graduates of other schools as to sex, age, race, scholastic aptitude scores, home and community background, interests, and probable future. The students from the "thirty schools" (especially those from the least traditional schools and those graduated recently after programs were improved), excelled in college physical sciences, and it is reported that they surpassed the control group in intellectual curiosity and in scientific approach to problems. The graduates of the "thirty schools" were judged to be precise, systematic, and objective in their thinking; they demonstrated a high degree of resourcefulness in meeting new situations, and managed to earn a higher percentage of nonacademic honors.

Ralya and Ralya (53) tested 325 college freshmen with an instrument devised from fifty-two correct and erroneous geological and astronomical concepts. They found that the prevalence of one misconception was no criterion as to the prevalence of a related misconception, and that freedom from misconception was positively correlated with scholastic aptitude. Ralya and Ralya (52) used a Science Inventory of 232 items to test 325 college freshmen, and reported results on eighty-two items in biology and anthropology which were selected to represent (a) common unfounded beliefs, and (b) important concepts and principles. Among the findings was evidence that many persons believed in spontaneous generation, that 70 percent were unaware that "human beings begin their lives as fertilized eggs," that many believe in the inheritance of acquired characters, and that 14 percent accept strong coffee as a remedy for malaria. The results again indicated that the high scholastic aptitude group fared better, and sometimes much better, than the low scholastic aptitude group.

Using 364 eleventh- and twelfth-grade pupils as subjects, Meder (43) found that groups studying a pamphlet about the physical universe gained more information than did pupils in discussion groups or control groups and shifted their opinions further from the concept that man is dominated by supernatural forces. The correlation between shift in opinion and score on an intelligence test was also significant. Brewer (7), who used both

"attitude" and "thinking" tests in his study of a college physical science survey group, detected some shifts in attitude during the semester. Salt (58) investigated erroneous ideas about health, using 3,221 pupils in thirty-two schools as subjects. Findings indicated a prevalence of unfounded beliefs, especially about advertised products and physical activity.

Nature of Learning; Understanding Applications

When physics teachers in twenty-four Wisconsin towns of less than 30,000 population gave their pupils tests based upon an analysis of textbooks, Ralya (51) found that pupils sometimes knew facts but not the principles involved; knew metric and English units, but not how to convert them; could recall formulas and figure out the answers to problems, but did not understand the principles involved. Sometimes pupils who were able to apply a principle in one situation did not see its application to other situations. Schindler (59) found that among 300 physics pupils in thirty-four Iowa schools, 70 percent memorized satisfactorily but only 17 percent really understood. Low-ability pupils in particular did better on items of simple recall type than they did on items which seemed to necessitate somewhat more understanding.

With 120 pupils of high-school physics paired as to teacher, previous science courses studied, and IQ, Kilgore (37) learned that both low- and high-ability pupils were significantly better in making application of principles when their course had emphasized applications. Similarly, Babitz and Keys (2) matched eight chemistry classes in two California high schools. Control groups followed standard methods of instruction, while experimental groups had more "direct and intensive instruction" on the application of principles. Tests required that the pupils solve chemistry problems and also be able to identify scientific principles related thereto. On post-tests all experimental groups showed superiority over control groups of the same school, although the differences were not statistically significant.

Huebner (28), Schwachtgen (60), and others studying with W. L. Beauchamp found that pupils who answered a series of study questions concerning laboratory work had better test scores than did those pupils who wrote formal reports on laboratory experiences. Steuber's study (66) of four physics classes suggests that a qualitative approach may be more efficacious than a quantitative one. On a test composed of both qualitative and quantitative problems there was no significant difference between students who had experienced only qualitative work and those who had solved quantitative problems. Mudge (45) reported that matched groups gained significantly during a chemistry course both with respect to knowledge and the ability to apply knowledge; the informational gain, however, was the larger. Her results showed no significant difference between high-school and college groups in ability to apply chemical knowledge.

Interest was also shown in the results of various methods used to teach college biology. Stevenson (65) reported upon the relative effectiveness of three types of instruction in a normal school. Kahn (35) compared the laboratory method with a demonstration method of teaching biology in colleges. Brown (8) in an extended investigation found that certain biological concepts and the ability to make interpretations in the light of them are taught as satisfactorily in nonlaboratory courses as in laboratory ones. According to Barnard (3), who was working with college students enrolled in two introductory courses in biology, the lecture-demonstration is better with respect to specific information, but the problem-solving method is superior with respect to problem-solving ability and the formation of attitudes.

Microprojection—Edith Brechbill (6) was interested in the microprojector as a teaching aid. She compared the learning of 550 paired (IQ and MA), biology pupils taught by two different teachers in two senior high schools. The experimental groups used microprojection and the control groups employed the older microscope technic. Four objective, standardized tests to "measure learnings from microscopic material observed" served as pre-tests and post-tests. In two experimental groups the gain was greater than in corresponding control groups, but in two other cases this result was reversed. In no case, however, was the difference statistically significant.

Changes in Behavior Following Science Study

One of the most challenging learning studies made in the five-year period was that of Bingham (4), who analyzed the effects of instruction (food and nutrition) upon high-school pupils. Bingham employed the usual tests and controls, but in addition he was able to get reasonably objective data concerning modifications in overt behavior subsequent to instruction. The Bond study (5) was of the more traditional type but introduced a new element in that it attempted to relate teaching of genetics to the objectives of general education. Bond's emphasis was upon change in information and opinion subsequent to instruction. Waters (70) analyzed pupil and group diaries, written work of pupils, anecdotal records of both the teacher and other observers, and pupil evaluations of their work in science, in order to study changes in pupil behavior.

Heil (25) reported the use of "inventories" to evaluate the effectiveness of science teaching (general courses) in eighteen colleges participating in a cooperative general education study. Specific items were "suggested in a large part by other investigations and agencies," or were contributed by "the individual college instructors and members of the central staff of the study." These items were then assigned to inventories in the case of health (the example cited). The student was asked to indicate the relative frequency with which he engaged in good and bad health practices for

each inventory. It is to be noted that while this technic gets at the testimony of the students, it does not measure actual overt behavior.

Prediction of Success in Science Courses

Clark and Rice (13) carried out an interesting study of 557 students in five science departments of Muskingum College. The estimates made by these students as to their marks were the same or higher than the marks actually received more than 75 percent of the time. The correlation coefficient between the estimates of all students and that of the professor concerned was .66; the comparable figure for mathematics students was .81. DeWitt (15) reported that college graduates who studied science, graduates who did not study science, and high-school graduates of an age similar to the others were equally able in estimating their own abilities.

Peterson (47) studied the relationship of certain tests and other items to predicting success in high-school biology. Dickter (16) studied the relationship between scholastic aptitude test scores and college grades in mathematics and science. Oakley (46) found intelligence test score and the rank in high-school class equally good criteria for predicting achievement in college freshman chemistry. Mercer (44) worked out a regression equation for success prediction in engineering curriculums on the basis of general mental alertness, mental multiplication of spatial relations, verbal academic response, and analytic reasoning. The Educational Records Bureau (39) has made available separate norms on the Cooperative Physics Test for College Students for typical students of college physics, for women students (scores are lower), and for engineering students (scores are higher). The responses of college sophomores to the Cooperative General Science Test were studied by Howard (27), who identified a high amount of a "science" factor and a low amount of a "complexity" factor within the test.

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CHAPTER VII

Teaching of Mathematics in Senior High School and Junior College

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Geometry and the Development of Logical Thinking

SEVERAL INVESTIGATORS have considered problems centering about the teaching of logical or "critical" thinking. Lazar (16) made an analytical and historical study of the terms "converse," "inverse," and "contrapositive" in geometry and their applications in textbooks. He formulated new definitions of these concepts and illustrated them with propositions from plane geometry. Smith (26) published data obtained in 1932 on errors made on a series of diagnostic tests by a group of 114 pupils having a mean IQ (Terman) of 118. He noted the extent to which, under ordinary conditions, students fail to comprehend the "if-then relationship" and the meaning of proof. He also showed how slight changes in the details and complexity of construction exercises increase the number of errors made by pupils. In 1939, with a group of 74 pupils so selected that the mean and the standard deviation of IQ's were the same as those of the 1932 group, the procedure was repeated except that methods of teaching were designed especially to emphasize and facilitate analysis and generalization by the pupils. A comparison of error counts revealed statistically significant reductions. This investigation provided data on the extent to which transfer fails to take place even within a narrow field unless it is facilitated by appropriate instructional methods.

Fawcett (9) sought to develop general concepts and abilities related to proof. He emphasized the necessity for clearly defined terms, for assumptions or unproved propositions, and for realizing that no demonstration proves anything beyond the limits set by the assumptions. The majority of his experimental group of 25 pupils was in the eleventh grade, having a median IQ (Otis) of 115. These students were given a course in which the primary features were (a) the development of geometric concepts and principles by individuals and by group discussion, without the aid of a textbook, and with unusual emphasis upon a creative type of logical thinking; and (b) the utilization of nongeometric reasoning situations for introducing, clarifying, and applying logical concepts and abilities. The organization and content of the course accordingly departed markedly from the traditional. Test results indicated that the pupils made a statistically significant gain in the ability to analyze nonmathematical material, while pupils in several other groups used for comparison did not. Fawcett recorded numerous instances of "transfer of training" apart from his tests. Although achievement of geometric knowledge was not the major objective, the median score made by the experimental group

on the Ohio Every Pupil Test in plane geometry fell between the 80 and 90 percentiles of the state scores. This study was not rigorously controlled, and the experimental group was small and probably unrepresentative, but the report has exerted considerable influence on instruction in geometry and has stimulated other investigations.

A study by Ulmer (28) extended Fawcett's results by making use of a control group of students taking an ordinary course in plane geometry and of a second control group of students who did not take geometry. These groups and the experimental group were each composed of 330 students so selected that the mean and standard deviation of the ages, the intelligence quotients, and the scores on an initial reasoning test were approximately the same. The classes in the experimental group were taught by ten teachers in six different schools. The classes in the geometry control group were taught by eight teachers in six different schools. The data indicate that the procedures used with the experimental group (primarily emphasis upon the application of principles of logic to non-geometrical situations) produced marked gains in the abilities measured by the reasoning tests. There was no measurable gain for the no-geometry control group and a slight gain for the geometry control group. The study ran for one semester only, and no measures of achievement in plane geometry were obtained. The experimental teachers reported, however, that there appeared to be no loss in achievement, and some indication of gain as judged by their regular tests. Ulmer also separated the data for each of the groups into subgroups having low, average, and high intelligence test scores and showed by the distribution of the mean gains that pupils at each intelligence quotient level are capable of profiting from special instruction in principles of logical reasoning. This study confirmed the results of numerous former studies to the effect that little transfer takes place unless special procedures are adopted to facilitate it. It extended Fawcett's results by showing that high-school geometry teachers, under normal classroom conditions, can teach in such a way as to develop the ability to apply principles of logical reasoning to non-geometric situations.

Essentially the same conclusions were drawn by Gadske (10) in a similar but unusually comprehensive study of the same problem. Six teachers in three public high schools taught 333 students in the experimental group. A control group of approximately the same size in three similar schools had a mean intelligence quotient (Otis) which exceeded that of the experimental group. This superiority together with the fact that the students in the control group devoted all of their time to geometry doubtless explains why the geometric achievement of the control group at the end of the study was superior. On a reasoning test, however, given to both experimental and control groups at the end of the experimental period, a significantly higher mean score was made by the experimental group. Questionnaires exploring the point of view of students toward

mathematics showed marked shifts in the experimental group between the beginning and end of the course in choice of mathematics as a favorite subject, in point of view toward values of mathematics, in concepts of critical thinking, in the number of books and articles read in connection with the course, and the like. These data, plus results of a nongeometric reasoning test and extensive observational records, support the hypothesis that the experimental group changed more than the control group in an educationally desirable direction.

Although these studies provide impressive evidence that the ability of students to handle nongeometric reasoning situations may be improved through appropriate procedures in geometry courses, the differential contributions of the geometric and nongeometric content have not been isolated.

Prediction of Success in Mathematics Courses

In the REVIEW OF EDUCATIONAL RESEARCH for February 1938, Douglass and Kinney observed that investigations aiming to forecast the probable success of students in mathematics courses were relatively numerous. This tendency has continued during the period covered by the present review but there has been no fundamental modification of previous findings.

Clifton (5) reported multiple coefficients of correlation of approximately .57 or lower between teachers' marks quantified on a five-point system and various other measures. Data were collected for 214 ninth-grade students during the years 1931-1936. The coefficient obtained by using for prediction both scores on the New Stanford Arithmetic Reasoning Test and the intelligence quotient was .57 and the inclusion of other variables including reading scores did not increase it appreciably. Seagoe (24) studied the relationship between scores ($N = 121$) on the Orleans Algebra Prognosis Test and other measures. She reported correlation coefficients between the Orleans test and three intelligence tests, namely, the Terman group test (given just prior to high-school entrance), the Otis Intermediate Examination, and the Kulmann-Anderson test (given two years later), of .63, .67, and .74, respectively. From these and other data she concluded that an algebra prognosis test, or better, the New Stanford Arithmetic Tests, would yield more reliable data for prediction than any intelligence test.

Layton (15) reported a coefficient of correlation of .82 ($N = 141$) between grades in eighth-grade arithmetic and ninth-grade algebra. Multiple correlation technic using intelligence quotients (Otis) in addition to arithmetic grades yielded .84; with scores on the New Stanford Arithmetic Test and the Lee Test of Algebraic Ability added, the multiple coefficient was .86. These values are relatively high compared with those reported elsewhere.

Additional evidence that effective retention and use (or transfer) of algebraic abilities is related to intelligence was presented by Pratt (21). Among a total of 1,229 American Council on Education Psychological Examination blanks of matriculating freshmen at a teachers college, he found 550 papers which contained evidence that algebraic procedures had been used in the solution of problems in the arithmetic section of the test. The mean scores of this group on the arithmetic section and on the entire test were higher (critical ratios 13.6 and 17.2 respectively) than those of the group giving no evidence of the use of algebraic thinking, and the superiority was not solely ascribable to the higher scores on the arithmetic section.

The prediction of success in college courses by means of correlation studies continues to attract investigators. Thus Dickter (6) computed coefficients of correlation between scores on the mathematics section (which, from 1930 to 1936, was a part of Scholastic Aptitude Test of the College Entrance Examination Board), and marks in five different mathematics courses at the University of Pennsylvania. He had a total of 4,423 cases, and his coefficients ranged from .40 to .60 approximately, the highest occurring when grades in college algebra were used. Since some students with low scores on the Scholastic Aptitude Test had not been admitted to the University, the range of talent was thereby restricted. Quaid (22) found that scores on the Ohio State University Psychological Examination and grades for the first semester of college mathematics correlated .561 ($N = 140$). When the second semester grades were used he obtained .855. The mathematics involved in these courses consisted of algebra, trigonometry, solid geometry, and analytic geometry. Although he also reported much higher coefficients resulting from a correction for attenuation, the value of such coefficients is doubtful since the underlying assumptions cannot be satisfied in practice. He also reported that the scores on the American Council Psychological Examination yielded coefficients of .61 and .63 with first and second semester grades respectively.

Data presented by Scott and Gill (23) indicate that the number of units of algebra taken in high school is more closely related to the grade in college algebra than the number of years that elapse between completion of the high-school and the college work. Marshall (17) gave the Columbia Research Bureau Algebra Test, the Iowa Algebra Aptitude Test, and the American Council Psychological Examination to entering college freshmen ($N = 44$). Grades in college algebra (for which he claims unusually high reliability due to the method of scoring tests used by the instructor) correlated with the algebra test scores to the extent of .79. Correlations with the aptitude and psychological examination were .56 and .49 respectively. This population is so small that generalization from it is unwarranted but the data provide some additional evidence for the long held and not unreasonable conclusion that achievement in a field is the best single index of success in subsequent courses in that field.

Kellar (13) studied the relationships among tests of algebra (four aspects), arithmetic (computation and reasoning), intelligence, reading, and memory. Scores from 284 pupils who had completed one year of algebra yielded a multiple correlation coefficient between verbal problem-solving ability in algebra and all the other variables, of about .81. Analysis of the data indicated that about 40 percent of the variance in algebra verbal problem-solving ability is due to variance in algebra computation ability and about 15 percent of the variance is due to variance in arithmetic problem-solving ability. Approximately 40 percent of the variance is due to causes not measured by the other tests, among which she suggests factors such as interest and attitude.

In summary, it may be noted that work on prediction to date suggests the hypothesis that a reliable index of the success of individual students in algebra is not likely to be found until methods are devised which reduce or eliminate the most probable sources of variability in previous investigations, namely, the known unreliability of teachers' marks and the influence of pupils' interests, work habits, and similar factors. Moreover, it seems likely that no widely applicable formula will be forthcoming, and that each school and college must study its own population.

Reading and Vocabulary Studies

Kellar's study referred to above provided data on the relationship between reading and the various factors she studied. The coefficients of correlation were positive but less than .51 except in the case of the tests of algebraic vocabulary and intelligence which yielded .56 and .76 respectively. McKim (18) constructed tests especially designed to measure reading of algebraic materials. These were administered to a group of 120 students for which the mean IQ (Terman) was 117. These students were, however, given no special instruction in reading algebraic materials and were taught by a method in which new work was presented almost entirely at the blackboard. The correlations of scores on the four parts of the McKim reading tests and intelligence quotients did not exceed .56 and the correlations with the scores on the midterm and final examinations did not exceed .62.

Stright (27) also studied the relationship of reading comprehension to skill in solving algebraic problems. One group ($N = 29$) of students spent one hour a week studying the "Student's Guide to Efficient Reading" by Pressey, and in reading books and magazines. They were also given special help in reading as needed. A control group ($N = 33$) comparable on the basis of the Iowa Silent Reading Test and the Henman-Nelson Test of Mental Ability was not given this training. At the end of the school year the differences in the mean scores of the two groups on a second administration of the reading test and on the Cooperative Algebra Test were favorable to the experimental group and were statistically significant. A similar study by Clark (4) also points to the same conclusion.

The effect of special emphasis in teaching upon the vocabulary of elementary algebra was studied by Drake (7). Experimental and control groups, containing pairs of students matched on the basis of both intelligence and algebra achievement tests, were secured in six different schools. Vocabulary tests for seven units were constructed using a multiple-choice technic requiring the student to associate a word with an example. During the unit, remedial instruction averaging about 7.5 minutes per class period was given the experimental groups. Results for five units and for the final algebra test were reported for combined groups from several schools (usually including 100 or more students) and showed significant differences favoring the experimental group.

Curriculum and Methods in Geometry

Brownman (3) compared two methods of teaching geometry as an experimental science in an industrial high school. He used experimental and control groups each composed of fifty students matched individually as to intelligence quotient and scores on a geometry inventory test. The control group was taught by the lecture-demonstration method, and the experimental group by the individual-laboratory method. On the basis of final test scores he found the latter method superior, particularly with respect to the acquisition of descriptive and experimental concepts. With respect to skills, applications, and the ability to solve "integrated problems," differences in the mean scores of the two groups were in favor of the experimental group but were not in general statistically significant at the usually accepted levels. No data were reported on the reliability of the tests used.

Using sets of exercises in geometry graded according to three levels of difficulty, Lane (14) investigated the effects of allowing pupils to select for proof a smaller number of more difficult originals in contrast with the more usual procedure. Ten teachers in nine high schools participated in the experiment. Experimental ($N = 174$) and control ($N = 163$) groups were equated on the basis of the means and standard deviations of the Orleans Geometry Prognosis Test and the Otis Higher Examination. Lane found that average scores on the final tests favored the experimental group by amounts which were not statistically significant. The plan of pupil selection of graded originals seemed to have some slight advantage for boys and was most suitable for pupils of high ability.

Pickett (21) analyzed 150 geometry examinations given during the period 1923-1935 among College Entrance Board Examinations, the New York Regents' Examinations, the Annapolis and West Point Entrance Examinations, and selected state examinations. He rated geometric theorems in terms of their utility in proofs and exercises demanded in the examinations, and found that sixteen theorems are sufficient to supply 50 percent of the reasons used in proofs. He prepared a "Persistent List of Theorems" and revised the list of the National Committee on Mathe-

mathematical Requirements, reducing the number of theorems from 89 to 58. He found that a major portion of the test items could be solved by the analytic method of proof but that the indirect method was seldom required on the examinations he studied. He also provided tabulations showing the relative importance of algebraic abilities, the relative frequency of theorems, definitions, constructions, postulates, and axioms used in proofs, and he reported that 36 percent of the exercises were applied problems calling for a numerical answer or algebraic treatment.

Teaching Slide Rule Computation

Problems encountered in teaching students to use the slide rule were studied by Shuster (25). He recommended that the fundamental concepts of approximate computation be taught first, and that the use of the slide rule should not be introduced before the middle of Grade IX on the ground that the location of the decimal point by expressing numbers in standard form cannot be efficiently taught earlier. He found that early instruction should be limited to one- and two-digit accuracy, and that considerable drill on reading the third significant digit and on examples involving zero as a significant digit is desirable. Errors in slide rule computation made by an experimental group of 150 college students were greatly reduced when special teaching technics based on these findings were employed. Moreover, students who had learned to use the slide rule efficiently made fewer and less serious errors in slide rule work than in pencil-and-paper computation.

Diagnosis and Remedial Instruction

The learning difficulties of students in a course in general mathematics at the college level were studied by Boyd (2). She gave approximately 200 women in Hunter College a series of 20 ten-minute short-answer tests and analyzed in great detail the errors made by 20 percent or more of the students. She reported that the greatest single difficulty was failure to understand the question to be answered. Difficulty was also encountered in understanding the conventions of tabular presentation and in computing with simple fractions. Many students apparently did not or could not study the text. Retests at the end of each unit were used to measure improvement after ten types of remedial work. Greatest improvement came through explaining the meaning of items and symbols misunderstood on the first test, clarifying fundamental concepts, and teaching the methods of attacking and planning solutions. Relatively smaller improvement resulted from defining words unknown to some students, reviewing memory work and algebraic manipulation, and attempting to remedy faulty expression.

A series of papers by Keller, Shreve, and Remmets (11, 12) reported results from the diagnostic testing program for freshmen in Purdue

University. A battery of three tests was used to measure students' ability to perform correctly fundamental manipulative operations in arithmetic and in algebra. For each arithmetic item an index of students' inability to perform operations and the accuracy of performance was reported. In the case of the algebra tests the errors were classified and reported in terms of a code.

The effect of a carefully planned program of remedial teaching in college freshman mathematics was investigated by Wolfe (30, 31). He employed an experimental group ($N = 66$) and a control group ($N = 63$) of initially deficient students matched on the basis of (a) score on an initial mathematics test, (b) chronological age, (c) decile group on psychological test, and (d) lapse of time since completion of last preceding mathematics course. Both groups took the same trigonometry course but the experimental group was given remedial instruction outside of class averaging fourteen recitation hours. The greater part of this work was highly individual and was based upon diagnostic test results. Wolfe found that this instruction reduced the failing rate of the experimental group, and that on the original test given again at the end of the trigonometry course these students had a higher mean score (critical ratio 12.6) than the control group and were better than the originally superior total group from which they had been selected. When the same test was administered at the end of the following course (college algebra), the superiority of the experimental group remained, the critical ratio in this case being 6.8.

Mathematics in Science Courses

Dunbar (8) analyzed twelve college textbooks in general chemistry to determine (a) the number of mathematical problems contained in them; (b) the amount of space devoted to these problems; (c) the types of problems; (d) the kinds of mathematics needed for solving these problems by the simplest and most direct methods; and (e) the correlation of these findings with a previous study of twelve high-school textbooks. He found (a) wide variations in the number of problems and space allotment; (b) the most frequent problems were those dealing with reacting weight, weight and density, concentration of solution, gas volumes, chemical composition, electrochemistry, and derivation of formulas from experimental data; (c) proportion is used in the solution of three-fourths of the mathematical problems; (d) mathematical problems in college general chemistry books are similar in type to those in high-school books but are far more complex and numerous. Nickle (19) summarized the mathematical content most used in physics, chemistry, and engineering. He examined twenty-eight master's and three doctor's theses leading to a summary list of topics considered most important when judged in terms of use.

The relation between grades in secondary mathematics, physics, and chemistry was investigated by Winegardner (29). Pearson's coefficients of

correlation between grades in two mathematics courses (elementary algebra and geometry), history, physics, and chemistry ranged from .49 for elementary algebra and physics ($N = 213$) to .64 for geometry and chemistry ($N = 304$). The first of these is smaller than the coefficient for algebra and history, which was .55 ($N = 425$). Winegardner concluded that among the variables he studied geometry grades provided the best single measure for predicting success in physics and chemistry.

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CHAPTER VIII

The Teaching of Science and Mathematics in Extraschool Education

M. L. ROBERTSON

THE DIVIDING LINE between nonschool educational agencies and the school as it interacts with the whole community in its integrated program is not definite, and the selection of areas for this review is, therefore, arbitrary. Reports and studies dealing with student needs are included; so are studies dealing with certain educative agencies, namely, newspapers, magazines, and books; radio; motion pictures; and clubs.

Several listings of educational agencies outside of school are available. Rugg (53) reviewed "Non-School Educational Agencies" and gave an extensive list together with a statement of the types of education judged to result from their activities. Gruenberg (19) listed agencies more specifically related to science. Thirty-four agencies are revealed in Mathewson's study of the means of meeting professional needs. These include books, magazines, government agencies, libraries, newspapers, and the radio. His study indicated considerable dissatisfaction with present functioning of these agencies.

The need for greater utilization of extraschool opportunities has been apparent for some time. In 1924, Harap (22) mentioned the wide discrepancy between knowledge and practices of citizens and approved standards for commodities. Misconceptions still exist among citizens (21, 31). Aldrich (1) summarized research in the area and indicated a need for more consumer health education, for the removal of misleading advertising, and for increased participation by pupils in community life. That pupils are participating widely in out-of-school activities, such as helping to choose household supplies and selecting camp sites, was reported by Relyea (50) who used a loose technic in her study. Bye (8) offered an extensive list of objectives for community study. Rubin (52) suggested that the medical examinations of children and home visits by the visiting nurse should educate parents. Extraschool agencies and experiences have been used for motivational purposes more than for instructional purposes, according to a statement by Breslich (6). Heaton and Koopman (25) established, as a category important for college students, one that involves such science materials as soils, minerals, plants, animals, and ecological relationships. Understandings in such a category would clearly be dependent upon community study.

Needs To Be Met through Extraschool Activities

The reports *Mathematics in General Education* (46), *Science in General Education* (47), *The Place of Mathematics in Secondary Education* (41),

and *A Philosophy for Science Teaching* (42) suggested ways and means for providing "rich and significant experiences in the major aspects of living so directed as to promote the fullest possible realization of personal potentialities, and the most effective participation in a democratic society." The emphases in these reports were upon the needs of boys and girls, problem solving as an essential skill, and life-centered activities as a means of learning. Their stress on primary sources of learning is interesting to contrast with earlier approaches to life-activities as educational factors (26).

Studies of pupil needs, together with studies of contributions of extra-school experiences toward meeting those needs, would seem to be of great value. That vocational needs are somewhat met by mathematics was reported by Meigs (36). Her follow-up study of vocational adjustment reported student opinion that mathematics was the high-school course, outside of business courses, most valuable for making vocational adjustments satisfactorily. That certain chemical principles had more utility for adult living than did others was found by Showalter (55) from an analysis of diaries kept by adults. Although considerable attention has been given to analyses of citizens' needs for mathematics and science instruction, little objective material has been reported concerning the contribution of non-classroom life-activities toward student development, especially mental and emotional development. With well-prepared materials, Aldrich (1) illustrated technics of community utilization. The desirability of a more refined technic in surveying industries to reveal community contributions to general science was pointed out by Loudin (34).

Burnett (7) stated that extraschool education seems more functional in controversial issues, such as genetics and evolution, than does formal training in science. Its value in teaching conservation information is reported by Capps (9) who compared pupils living in rural communities with ones living elsewhere. The pupils testified that summer camps, Boy Scouts, nature clubs, newspapers, magazines, and the radio were helpful nonschool agencies. Relations between thirty-two extraclass activities and achievement in academic subjects were determined by Beauchamp (3) in a study of 900 schools and 6,500 pupils. Positive relationships between science and Scouting, collecting, and other hobbies were noted. The findings of these studies are in contrast to Downing's earlier report (16) that out-of-school experiences did not contribute to science information as then measured.

Should student needs be met through school courses or through educational experiences which include both school and out-of-school activities? Whether mathematics should be taught in a series of separate courses or as one phase of a unified educational matrix was one of the twelve issues in mathematics teaching identified by Howard (29). The National Council of Teachers of Mathematics favored relating the child's experience to his total environment, including extraschool situations. Boardman (5) main-

tained that the school and the community are jointly responsible for the development of happy, efficient, and successful adults. There seems to be a real need for studies dealing with methods of selecting and utilizing extraschool educational experiences in both science and mathematics.

Newspapers, Magazines, and Books as Sources

Since Curtis (13) pointed out that large amounts of scientific literature are read for recreation by pupils who are given access to suitable books and magazines, the potential contribution to education in science of various types of publications has been studied. Both Curtis (13) and Rice (51) reported that extensive reading of general science materials contributed materially to the scientific information possessed by pupils. Students themselves, according to Kutz (31), testified that they found newspapers helpful in keeping up with current information, for instance, about health. However, children of foreign-born parents seemed to prefer picture newspapers and motion pictures to reading material (56).

Both earlier and later investigators claimed that nonschool materials give an emphasis to science and mathematics unlike that found in school. Public health is more important in the biology found in newspapers than would be indicated by the space given to it in textbooks (28, 31). Food-producing plants are given seven times as much space in current periodicals as in textbooks (38). Analyses made of reports from Consumers' Research, Incorporated (45), *Life* magazine (15), and publications of the U. S. Biological Survey (57) revealed terms and principles not used in textbooks. In 98 government publications, Weid (57) found twelve principles of biology mentioned nearly 5,000 times. The principle, "Food, oxygen, moisture, and temperature are necessary to life," accounted for 85 percent of the mentions. That greater attention is given to biological than to physical science in published materials was evident from an early study by Searle and Ruch (54). However, analyses of periodicals and books have also been made for both chemical and mathematical concepts. Nuser (44) studied the chemistry found in agricultural periodicals and reported that the chemical processes of everyday living were emphasized. Downs (17) analyzed newspapers to determine what mathematical concepts and abbreviations were used. He found more than a thousand which were not treated in elementary mathematics textbooks. Woodruff (59) analyzed nearly 500 books and periodicals by the Braun-Blanquet quadrant method in order to determine what mathematics was essential to biology at each level of instruction. Newland (43), in a careful study of the articles and advertising of 200 issues of four popular magazines, found 2,490 allusions to science occurring in 24,022 contexts. The three most emphasized allusions were made to personal health, food, and appliances. Two percent of the allusions were found to be persistent over a ten-year period.

A similar analysis with particular reference to health claims in advertising food, drugs, and toilet supplies was completed by Edgerton (18). She identified health claims in twenty-two magazines and eight newspapers, validated the accuracy of the claims by authority, and submitted a checklist of the items to a well-chosen sample of about 800 women. She found that (a) health concepts of 50 percent of the cooperating women paralleled the claims in the advertisements, (b) invalid health claims were accepted by 50 percent of the women, (c) less agreement with invalid claims accompanied more schooling, (d) fewer invalid claims were accepted by women under twenty-five years of age than by women over twenty-five years of age. A need exists for more studies of meanings and attitudes developed through the circulation of printed materials among consumers. Attention might well be given to criteria for selection and presentation of such materials as are educational.

Radio in Science Education

Of 400 articles, theses, and books relating to radio, Miles (39) found ten which referred to the teaching of science in or out of school. Lohmeyer and Ojemann (33) reported that science material presented by talk or dramatization is learned better than that presented by discussion. The criteria of value for radio programs seem to include acquisition of information, formation of desirable attitudes, and stimulation of interest. In the Lazarsfeld study (32), children who were questioned reported the acquisition of information especially from "quiz" programs. Cohen (12) found that the radio was as effective as silent reading for having children gather information. Carpenter (10) stated, without supporting evidence, that desirable attitudes toward and interests in science could be developed through radio use. That such values might not be limited to children might be inferred from the fact that 25 percent of the parents of the 18,500 pupils also listened to the programs. Further evaluations of radio programs may be found in reports of the Federal Radio Education Committee of the Federal Communications Commission.

Motion Pictures

What are the educative values of motion pictures for the many who see them? This is an important question for those concerned with what children are learning. Nearly a third of the 70,000,000 persons in weekly attendance at motion pictures are minor children (14). Most of them view recreational films rather than scientific or documentary ones. Currently, though, hundreds of films for educational use have been selected by the Advisory Committee on the Use of Motion Pictures in Education (24). That there are informational learnings from seeing motion pictures is evidenced by many studies, from the early one by Wood and Freeman (58) to the current one by Bell (4). Gains in information and in ability

to interpret phenomena are in excess of gains through some equated means of instruction. This is especially true for older pupils who profit more from motion pictures than do younger ones, according to Bell, and to Reitze (49).

Clubs Which Foster Science

Since Meister's early study (37) in which unequated groups in a science play shop were found to acquire knowledge, constructive ability, and ability to plan, attention has been given to the educative values of clubs. During that time, clubs have increased in number. In 1939, according to Joseph (30), there were 1,500 clubs in science and engineering, including student science clubs in senior high school. Programs of the latter were analyzed by Astell (2) and were found to be mainly extensions of classwork, rather than programs of life-centered activities. One value of student science clubs was reported by Clem and Dudleston (11) who found that club members excelled nonmembers in respect to knowledge of common science. Mussey (40) found that a scholarship society stimulated scholarship in brighter pupils, although not especially so for pupils in science.

Joseph (30) developed a technic for selecting club activities. By the use of suitable criteria and the aid of expert juries, he selected from 2,385 noncurriculum activities, 185 which were thought to contribute to understanding stated principles of science. Zim (60) analyzed 815 nine-page questionnaires and reported that one-third of the boys and girls responding indicated membership in scientific clubs. Zim was primarily concerned with adolescent interests in science. He went on to report that adolescents develop science interests through visits to such places as museums and zoos; nearly half of the hobby interests of boys and girls are potential leads to science activities; sex differences are evident in relation to membership in science clubs; and science books and magazines play definite roles in adolescent science activities. Zim also analyzed 1,576 individual entries in the Children's Science Fair of the American Institute of the City of New York, together with 506 of the exhibits. He found that boys were approximately five times as active participants as were girls; and that certain science areas, as well as certain specific interests within those areas, were favored for exhibits. In a further attempt to explore the effect of science interests upon activities in and out of school, Zim studied questionnaires from 230 exhibitors. He interpreted the data to indicate that (a) help with the science exhibits was obtained from science teachers, friends, and fathers in the order named; (b) both boys and girls exhibited strong preferences for science related to health, growth, reproduction, and animal life; (c) half of the science collections exhibited were biological ones, assembled usually within three years; (d) 72 percent of the boys and 68 percent of the girls worked in science laboratories outside of school

hours; (e) 63 percent of the boys and 25 percent of the girls had a place to experiment at home.

Activities of a camp were analyzed by Hollandsworth (27). He compared them with a composite list of general science activities and found that 75 percent of the listed activities were treated at camp with parallel activities. His study had no indication that the camp program was typical.

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CHAPTER IX

Teacher Education in Science and Mathematics

R. WILL BURNETT

A DECADE AGO reports of research about the preparation of teachers of science and mathematics frequently questioned their own validity on the grounds that the goals of science and mathematics education and the responsibilities of teachers of those subjects were as yet unclear. This problem of clarification has also been the concern of a considerable proportion of research reported since 1930. Various criteria for the reorganization of content materials in teacher education have been explored. Today philosophizing is increasingly supported by research data in picturing the function and preparation of the teacher who has competence.

Historical Trends in Teacher Preparation

Van De Voort (33) discussed the history of the preparation of science teachers in normal schools and teachers colleges in four periods. The period 1832-1860 emphasized discipline of mental faculties and object teaching; 1860-1910 was characterized by departmentalized science and the introduction of special-methods courses; 1910-1920 emphasized organization on basic principles, functional science of the environment, and general education courses as a supplement to special-methods courses. In the interval from 1920 to the present there has been a growing movement for professionalized treatment of subjectmatter. These findings were supported by Glover's study (14) of biological courses offered in mid-western teachers colleges. Lecture method with museum demonstration flourished until about 1880. After the early emphasis on taxonomy, the aspects of morphology and physiology gained headway. Under the influence of Agassiz and Huxley, laboratory and "type" study of biological specimens developed about 1900. Reaction against the type study appeared about 1920, and unified biology courses stressing principles and processes slowly appeared. Now there is an increasing tendency to provide a "science" major or minor, and survey courses. Glover presented evidence that teachers colleges, in copying the liberal arts curriculum, became degree-granting institutions with lack of clarity in aim. Studies which attempt to clarify the function of the teacher-preparing institution and the preparation which the teacher needs for his job are of significance at the present time.

Teacher Opinion as a Criterion for Training Programs

Several studies have reported teachers' opinions about their responsibilities, the adequacy of their teaching, and, directly or indirectly, the

adequacy of their preparation. Witherspoon (36) analyzed experiences of a sample of teachers graduated from California state colleges in 1939 and 1940. The teachers believed science experiences should be part of the elementary program, yet only 6 percent of the teachers believed they dealt adequately with science. Their avoidance of it was due to lack of personal knowledge and preparation and inadequate training with simple equipment. They reported courses in nature study as of greatest value, and broad integrated courses as particularly important. Teachers were in favor of professionalized courses in science which would work with curriculum materials and methods of presenting science, especially physical science, to children. Brechbill (5), using questionnaire responses, found high-school science teachers of the opinion that courses in the teaching of science were of more value than other courses in education.

Hagen and Samuelson (16) reported for the Committee on Subject Matter Preparation of the North Central Association. Questionnaire responses from mathematics teachers in twenty states indicated the importance of a training program that includes: a broad general education; intense training in mathematics; training in closely related minors of physics, general science, and chemistry; and general and special courses in professional education. More than 90 percent of the teachers favored a general education background including sciences, social sciences, art, music, literature, religion, philosophy, and ethics.

Burnett (6) reported a study which formed a research basis for the report of the Subcommittee on Teacher Education of the National Committee on Science Teaching. Data secured from elementary- and secondary-school science teachers throughout the United States corroborated findings of Witherspoon and Hagen. A majority of the respondents (generally more than 80 percent) conceived their major function to be that of bringing their specialized abilities to bear on the problems and interests of young people. Teacher avoidance of a number of important problems of youth was said to be due in a large part to insufficient knowledge of the science issues involved. The author of the study concluded that subjectmatter courses organized originally for research workers, doctors, and engineers should be reorganized into functional courses for teachers. This conclusion was in harmony with the recommendation of the Committee on Subject Matter Preparation of Secondary School Teachers (24) that reforms in subject-matter preparation should be based upon a realistic understanding of the high school and its problems.

Teacher Information and Misinformation as Criteria

Taylor (31) reported that test scores of prospective elementary teachers entering a midwestern state teachers college were deficient in arithmetic mechanics and understanding. His comparison of the 1929 offerings of 187 normal schools and teachers colleges in 42 states with the 1935 offerings of 128 institutions in 39 states showed a decrease in number of semes-

ter-hours offered in arithmetic. Taylor recommended that the four-year course for prospective teachers should contain not less than eight semester-hours of professionalized mathematics, mainly arithmetic. Ralya and Ralya (26) made similar recommendations on the basis of their study of the science misconceptions of women who were prospective elementary teachers.

Teacher Activities as Criteria

An analysis (15) of the community relationships of more than 9,000 public-school teachers selected as a national sample showed the extent to which teachers are a part of the communities in which they teach. Greenhoe, having studied the teacher responses to a 50-item checklist, found that most teachers brought up in small towns teach in communities of the same size. More than 70 percent of the teachers and more than 50 percent of the administrators reported no community-betterment services; yet 95 percent of the teachers reported membership in one or more community organizations, such as the church, parent-teacher association, Sunday school, Red Cross, and so forth. One-third of the teachers reported no visiting at the homes of their students. Such data certainly have implications for the preparation of teachers.

Powers (25) reviewed literature bearing on the teacher's job and institutional practices (as of 1932). He suggested a broad program for the prospective secondary-school teacher including an orientation course in natural science; specialization in one or more sciences; general psychology and education; and substantial preparation in English and social studies. Seven years later Noll (23) presented a similar analysis and recommendations. In 1926, Finley (11) likewise recommended a broad preparation in biology, with induction into the other sciences; specialization in some science of interest; and professional courses such as those in methods and in curriculum.

Science Curriculum Materials as Criteria

Rudy (29) analyzed 84 elementary science textbooks and 38 courses of study and recommended for the preparation of elementary science teachers (a) a functional course in physical science and one in biological science related to the needs and interests of elementary students; (b) an introductory course in one special science field, emphasizing methods of science; and (c) a final course stressing methods of presentation and curriculum construction. Billig (3) derived content for a professional course in science for elementary-school teachers by an analysis of literature and of outlines of science curriculums in elementary schools. Technics of teaching prospective teachers included illustrative demonstrations, experiments, readings, field work, and the use of visual aids suitable for students in elementary grades.

Benner (2) analyzed the topics in general science textbooks and courses of study to determine the percent of content from each of the special science fields. This pattern of text content she compared with the actual science preparation, and with the state certification requirements, of teachers of general science. Lack of preparation was especially evident in the fields of agriculture, astronomy, bacteriology, geology, and meteorology—fields from which more than 25 percent of general science topics are drawn. Certification requirements for general science in most states were found to be those for any specialized branch of science.

Present Status of Preparation of Teachers

Boone and Jameson (4) found that about 13 percent of 855 science teachers in California junior and senior high schools had no college training relevant to subjects they taught. The percent of adequately trained teachers in 1934 was estimated to be not in excess of 40. Douglass and Stroud (10) reported a similar study of 1,024 secondary-school science teachers in Minnesota. The majority of the teachers having one or more classes in science did not have a college major in science. Especially in the small schools in the state it seemed difficult to obtain teachers qualified to teach several fields of science. Wright (37) examined catalogs of 255 institutions of higher learning which trained elementary-school teachers. One-fourth of these required a unit in high-school science for admission. Four institutions required six courses in science during training; at the other extreme, five institutions required no science training of prospective elementary teachers. Two-thirds of the institutions required three or more courses in some science; biology was most often mentioned specifically. The state requirements for certification of elementary-school teachers were found to be generally lower than were the training school requirements, both in total length of the training period and with respect to the number of science courses demanded.

Ford (12) analyzed the catalogs of 36 teachers colleges in the area served by the North Central Association to determine minimum requirements for prospective science teachers. He found that only four colleges required work in earth science and astronomy and that four colleges limited their requirements for a science major to beginning courses in science. Ford's conclusion was that few of the colleges studied required enough work in the entire science field to prepare for teaching the sciences offered in high school. Hicks (17) examined the preparation of science teachers in Texas to determine the extent to which they had met the state requirements. Of the beginning teachers in 1934-1935, approximately one-half had elected nonscience majors in college. However, 82 percent of all science teachers in the state had met the state requirement, and the number of adequately prepared teachers was apparently increasing.

Sneltz (30), of the American Committee of the International Commission in the Teaching of Mathematics, found that secondary-school teachers

of mathematics had units of college credit in mathematics ranging from 0 to 90 semester-hours, with 20 percent of the teachers having less than 20 semester-hours. Most mathematics teachers taught in additional fields, especially science and social studies. Turner (32), in the Fourteenth Year-book of the National Council of Teachers of Mathematics, contrasted education of mathematics teachers in the United States with that in England and Wales. In the United States, teaching requirements are generally determined by certification agencies, with minimum requirements averaging between 15 and 18 points in mathematics—an amount insufficient for competence, according to Turner. Academic qualifications were found less high in America than in England and Wales. The study pointed out that academic and education departments differed in points of view. The education department considered that knowledge of the problems of children and of society constitutes a focus toward which subjectmatter competence should be directed; academic departments stressed logical organization of subjectmatter. American teachers colleges were thought to evidence an increasing professionalization of subjectmatter.

Gemmill (13) investigated the amount of science for prospective elementary science teachers in 16 institutions in 10 states. In about half of the cases, students were graduated with only one science course, usually biology. Exclusive of 17 percent of the group who had taken general science, only 5 percent had had any work in physical science. In many instances, students were able to graduate without studying any science. Davis (9) reported that one-fourth of the Ohio elementary teachers were securing eight hours or less of science, and that one-half were securing twelve hours or less. On the basis of a review of literature, Davis recommended that science teachers in the elementary school have some contact with the philosophy of science education. Rhodes (28) compared the records of elementary teachers in a California county in 1928 and 1938, and found a 42 percent increase in quarter units of science during the ten-year interval. He noted an increase in introductory professionalized science courses.

Cunningham (8) analyzed curriculums and facilities in use in 17 teachers colleges and in 25 elementary schools and found need for further equipment for teaching physical science teachers. Crosby (7) found that the critic teacher in science was selected on the basis of teaching success, scholarship, personality, years of experience, and science preparation.

Professionalized and Survey Courses in Science

Although studies have recommended professionalization of subjectmatter, the nature of desirable professionalization has elicited only a limited amount of research. Hurd presented a series of studies (18, 19, 20, 21) designed to determine what constitutes professionalized subjectmatter in practice. He reported (a) the viewpoint of instructors in science in institutions preparing teachers, (b) student reactions to professionalized courses,

(c) descriptive accounts by instructors of professionalized courses. Although Hurd found that institutions preparing elementary-science teachers were in advance of other institutions, he said: ". . . we cannot hope that a science curriculum composed largely of conventional courses designed for no one in particular unless it may be the prospective biologist, physicist, or chemist, will meet the needs of prospective teachers of elementary, junior high, or senior high pupils." According to Baker (1), teachers of professionalized and integrated courses indicated that they were offering courses from the viewpoint of science as a way of living and of meeting problems of life, were attempting to balance biological and physical science content, and were building content around general principles or areas of living. Watson (35) found that instructors in physical science survey courses in high school and junior college have been prepared to teach separate physical sciences rather than a generalized course. Watkins (34) studied patterns of sciences offered in Missouri high schools and identified a need for teaching majors in science rather than majors in some branch of science. Reynolds (27) found a 76 percent increase in teachers colleges offering a complete pattern of generalized science rather than a single course during the interval of 1934-1938.

In-Service Education

Mathewson (22) secured teacher judgment on needs for in-service education and on ways of meeting these needs. The most common needs were: "making science more functional, providing adjustments and applications to life," and "skill in organizing the content and methods of science to achieve the aims and objectives." Others were evaluation of other than factual assimilation; provision for diversified pupil activity; broad understanding of the aims of science education as a part of general education; and understanding of child and adolescent psychology, drives, and interests. The most common suggestions for meeting these needs were science educational books and magazines, and campus or extension courses. Others were science books, research and curriculum revision by committees of science teachers, programs of science teachers associations, and general educational books and magazines.

Needed Research

Research studies of the past twelve years dealing with the preparation of science and mathematics teachers have been primarily concerned with broad outlines and sequences of courses. Rarely has research considered the science and professional content which would be of optimum value to teachers. This circumstance was to be expected in view of the transition during the past decade from a subjectmatter to a general-education emphasis. Detailed research into content and methodology would have been rather sterile with the function of the teacher in presentday America so

unclear. Now precise studies of functional courses designed to meet the needs of prospective teachers would be in order. Research of the past decade has pointed toward functional science courses to prepare teachers for dealing with problems of young people and society. It is to be hoped that research of the next decade will clarify the nature and relative values of various functional materials in science teaching.

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FOREWORD

A NUMBER OF THE CHAPTERS of this issue were prepared under somewhat difficult circumstances by workers who are devoting part or all their time to war activities.

This is the third issue of the REVIEW to be devoted exclusively to research techniques and methods. E. F. Lindquist was invited to assume the chairmanship of the committee for this issue, but when he reported that he was giving all his available time to a new testing program and to war duties, the Editorial Board decided to assume responsibility for the planning and administration of the issue as a matter of experiencing at firsthand the work which committees are called upon to do. This is a situation somewhat similar to that surrounding the first issue on this topic when Frank N. Freeman, then chairman of the Editorial Board, assumed the chairmanship of the special issue of February 1934 on "Methods and Technics of Educational Research." That number was published at the end of the first three years of existence of the REVIEW. The second issue devoted to "Methods of Research in Education," December 1939, did not appear till the end of the ninth year of the REVIEW's life. The second cycle of the REVIEW, in other words, did not have any volume summarizing specifically the advances and practices in research methods for that period. There were, however, several chapters which occurred during that period on research methods, distributed among various issues of the REVIEW. These were detailed in the Foreword to the December 1939 issue.

The present issue comes at the end of the fourth cycle of the REVIEW and is concerned with research methods of the past three years. Whereas the December 1939 issue, under the chairmanship of Carter V. Good, was organized into nineteen chapters, the present issue condenses the outline into a smaller number of larger areas. This was done primarily in an effort to reduce the length of the issue. The topic of "appraisal" has been added at the direction of the Editorial Board. As is usually the case with the REVIEW, much good material has had to be sacrificed to keep the length of the issue within bounds, and contributors have foregone the inclusion of many references in their bibliographies which an unlimited printing budget would have permitted.

This issue of the REVIEW concludes the first full experience with the new schedule of topics which was adopted by the Editorial Board at its meetings in 1938 and 1939. This schedule involved the experiment of printing five issues dealing with particular subjectmatter fields or areas, rather than having these several fields treated under an organization which separated each one of them into elementary-school methods, high-school methods, psychology, measurement, and curriculum. The first three cycles of the REVIEW followed the earlier pattern with only minor changes.

The experiment with the new list of topics has seemed, at least for the present, to be satisfactory and the schedule is being continued for the next

cycle in substantially the same form. An effort, however, will be made to avoid the double issue which occurred in October 1941. Accordingly, fine arts will be combined with the language arts and appear as the April 1943 issue. A new title, "Education for Work and Citizenship," will replace the title "Social Studies" and will be somewhat broader. Special attention to research on the war and education will be given in the February 1943 issue, which is devoted to "The Social Background of Education"; and later issues also will deal with the war as it impinges upon their several areas.

DOUGLAS E. SCATES

Chairman of the Editorial Board

CHAPTER I

Bibliographical and Documentary Techniques in Education, Psychology, and Social Science

CARTER V. GOOD

THIS CHAPTER is concerned with recent literature on research procedures which depend primarily on the utilization of documentary sources. The topics treated include (a) library guides and tools in education, psychology, and other social sciences; (b) historiography and legal research; and (c) documentary reproduction.

New Library Guides and Tools in Education

Limitations of space permit the listing of only the recently issued guides most helpful to workers. For additional and more detailed information, standard full-size manuals (4, 139, 140, 191, 230) are available. Most notable is Alexander's revision of his general treatise on library aids and procedures in education (4) providing a recent comprehensive presentation. Thorpe's brief guide (207) is useful, although the attempt to cover in annotated fashion the sources for educational research in only 24 pages has resulted in omissions and in some inaccuracies. The guide by Williams and Stevenson (228) is pointed primarily toward the needs of undergraduates but should prove helpful to many graduate students. Extensive individual bibliographies and major summaries of research are treated only in terms of the guides for locating them. Most of the guides which were regularly published before 1936 were summarized earlier by this writer (87) and are not reviewed again here. It should be noted in passing, however, that the chief serial guides at that time are still the principal tools for library work in education, notably, the *Education Index*, the annual U. S. Office of Education *Bibliography of Research Studies in Education* (90), the bibliographies in the *Elementary School Journal* and the *School Review* (which were assembled annually and published as a monograph up to the 1938 references), *Education Abstracts*, and the REVIEW OF EDUCATIONAL RESEARCH itself. The *Readers' Guide to Periodical Literature* and the *International Index to Periodicals* continue to render supplementary service.

A valuable tool for canvassing educational research literature in general and for obtaining overview treatments of various problems is the *Encyclopedia of Educational Research* (138) directed by W. S. Monroe and sponsored by the American Educational Research Association. There are some gaps in the topics covered. The REVIEW OF EDUCATIONAL RESEARCH, also sponsored by the Research Association, is a major guide, providing overviews and bibliographies of research in problem areas. As a rule, it has

included fifteen major subdivisions of education within a three-year cycle (as listed recently on the inside back cover). A twelve-year index of the contents of the REVIEW is now in process of preparation. The *Encyclopedia of the Social Sciences* (189) contains some material on education, as do most of the guides cited in the following sections on psychology and other social sciences.

A comprehensive guide from 1910 or earlier to 1935 is the Monroe and Shores catalog of more than 4,000 annotated bibliographies and summaries listed under author and subject in one alphabet. This listing has been kept up to date since 1935 in part by the *Education Index* and also by the *Bibliographic Index* (21). This latter is a quarterly bibliography of bibliographies on a wide range of subjects, including various educational heads. The first number was published in March 1938. A recent, brief bibliography of educational bibliographies was prepared by Brickman (28). The *Dictionary of Education* (3, 82) will be helpful as a means of orientation, especially in clarifying concepts.

Guides to periodicals and serials—"Serials" may be defined as "any publication issued serially or in successive parts more or less regularly" (191). Most of the tools already cited relate to periodicals or serials. A number of general lists of serials, not necessarily educational, should be noted. The Ayer list (15) is a bibliography of newspapers and periodicals but includes much additional information. The Gregory union list of serials (92) shows the extent to which more than 75,000 different serials are found in 225 of the most important libraries in the United States and Canada. Ulrich's list of 10,200 titles (208) represents the periodicals published in the United States and in foreign countries, especially those of England, France, and Germany, that have proved most useful in American collections. Lyle (131) has grouped his classified list of periodicals for the college library by academic fields of study. For more detailed information concerning use of the guides to serials, the reader is referred to selected sources (2, 4, 14, 234). These references contain tabulations of the years covered by the various indexes to the literature.

Guides to educational books and monographs—The *Education Index* is still the most useful guide to books and monographs in education. *School and Society* has continued its publication of an annual classified list of educational books, monographs, yearbooks, and bulletins, with a selected list of sixty books marked with an asterisk (221). The titles of the sixty books of the year also appear in the April number of the *Journal of the National Education Association* (114). The *United States Catalog* is kept up to date by the monthly *Cumulative Book Index*, which cumulates at irregular intervals during the year, annually into a supplement, and after several years into a large supplement. Each entry includes information concerning author, title, edition, date, publisher, price, and paging. In a sense, the *Publishers' Weekly* supplements the monthly *Cumulative Book Index*, in that it describes and indexes new books in a convenient reference

and buying list. Selected bibliographies of books, such as the *A.L.A. Catalog* and supplements, are helpful. For volumes later than 1936, *The Booklist* provides semimonthly selections and evaluations of books. The *Book Review Digest* offers guidance in the evaluation of some 4,000 books during the course of a year. Detailed bibliographical references for these publications have been given earlier (87) and will not be repeated. Bridges (29) listed two hundred series of professional books, bulletins, and monographs in education published since 1900.

Guides to graduate theses—The comprehensive guide to masters' and doctors' theses in education continues to be the annual *Bibliography of Research Studies in Education* (90) of the U. S. Office of Education. Beginning with the titles of 1912, the Library of Congress printed an annual volume of published doctors' theses in all fields; this ceased publication with the theses of 1938 (211). Because this publication was usually two years late and omitted unpublished theses, another agency began a complete annual listing (61) with the titles of 1933-34, and since the year 1938, has been alone in carrying forward this work. Doctors' theses under way in education have been listed annually, beginning with 1931, in the January *Journal of Educational Research* (83). Reference may be made to an annual summary (85) of doctors' theses in school law, with a list of masters' theses in the same field, and to an annual listing (65) of the recipients of doctors' degrees in modern foreign languages.

Many institutions now publish abstract volumes or lists of their theses, usually representing all the graduate work of the particular university but sometimes devoted to summaries or lists of the theses in education alone. A basic guide (156) to such summaries and lists of theses is available. An older source (60) also may prove helpful. The annual *Bibliography of Research Studies in Education* (90) lists such institutional summaries under the heading of "Research, educational—reports." The *Education Index* offers similar guidance under the topics of: "Dissertations, academic"; "Abstracts, educational"; "Degrees, academic"; "Degrees, doctors'"; and "Degrees, masters'."

Special educational areas and problems—In addition to the guides described above and the serial bibliographies in the following paragraph, special aids prepared to facilitate canvassing of the literature of a limited educational area and published since 1935 are school administration (35), school law (59, 99), teacher training (126), adult education (19), testing (195), philosophy (161), business education (93, 215), physical and health education (78), handicapped children (127), nursing education (97), industrial arts (89), rural education (53), Negro education (167), Boy Scouts (133), and publications of the U. S. Office of Education (214). Yearbooks dealing with mental measurements (36, 37, 38, 39, 40), and with research and statistical methodology (41, 42), enable the student and research worker to keep in touch with current developments in these fields. Dictionaries of statistical terms (123), measurement and guidance (194),

occupational titles (210), and philosophy (16, 181) provide orientation for interpretation of the concepts represented.

Serial bibliographies and summaries in limited areas of education—Many of the previously described comprehensive guides to the literature are in effect continuing bibliographies. There are also serial bibliographies or summaries of research for a number of specifically limited subdivisions of education. Most such references are annual in their appearance and have continued over a number of years. As a rule, the bibliography of summary for a particular year refers the reader to the earlier numbers in the series. Selected topics represented in the bibliography of this chapter are educational books of the year (222), major educational projects and large-scale investigations (84, 188), deliberative committee reports (43), methods of research (99), teacher supply and demand (71), junior college (70), courses of study and curriculum materials (32), curriculum making (125), reading (91), science teaching (58), modern language teaching (205), physical education (2), and Negro education (119, 120, 166).

Bibliographical, institutional, organization, and statistical directories in education—A number of handbooks of information and directories include biographical facts concerning individuals or statistical or personnel data for institutions. Among the overlapping illustrative references of this type are those dealing with leaders in education (46, 225), specialists in philosophy (226), college and university presidents (171), public and private schools (158), universities and colleges (132), special resources in 765 libraries (218), school supplies and equipment (187), educational buildings and grounds (10), individual professional organizations (5, 33, 190, 223), and registration statistics of higher education (218). The most widely used educational directory (212) probably is that issued annually in four parts by the U. S. Office of Education: I. State and County School Officers, II. City School Officers, III. Colleges and Universities, and IV. Educational Associations and Directors. The educational and social directories and yearbooks for 1942 listed in Part IV of this Office of Education publication (213) number eighty-one. If publications are issued by the educational and learned associations, such journals, yearbooks, or proceedings are named. The general biographical directories—*Who's Who in America*, *Who's Who*, and the *International Who's Who* (109)—include a considerable number of educators. The *Directory of American Scholars* (44) includes a large number of professors, though not mainly in departments of education.

Guides to Psychological Literature and Data

Many of the educational guides cover a considerable amount of psychological research. In fact, there are certain areas where it is difficult, if not impossible, to draw a sharp line between the two disciplines; for example, learning and conditioning, personality and character, vocational guidance, mental tests, or childhood and adolescence. Therefore, for selected topics the student of psychology may find pertinent information in the previously

described educational guides, including the *Encyclopedia of Educational Research*, *Education Index*, and REVIEW OF EDUCATIONAL RESEARCH. There may be times when the student may find it desirable to use the guides for all the several areas (education, psychology, and social science) discussed in this chapter in working out a single problem.

The major comprehensive guide to the literature of psychology is the monthly journal *Psychological Abstracts* (172) founded in 1927. An author and subject index to the abstracts printed during each year is issued as an extra number each December. The *Psychological Index* (174), established in 1895, suspended publication in 1936. From 1927 to 1936 the two journals performed an overlapping service. As the titles of the publications indicate, one includes abstracts or brief summaries while the other is merely an index or list of references. For publications prior to 1927 the *Psychological Index* is the only major comprehensive guide available. Both of these publications cover periodical literature, books, monographs, and published theses.

A list of topics in psychology should prove useful in identifying appropriate headings for canvassing psychological materials (95). A handbook of the literature of psychology (130) and a compilation of available bibliographies (129) are valuable for the periods represented. In certain large areas of psychology extensive summaries and guides have been provided: general experimental psychology (144), social psychology (145), and child psychology (143). The monthly *Psychological Bulletin* (173) usually publishes one or more critical surveys of the literature dealing with a specific psychological problem. Psychology is well equipped with dictionaries (16, 74, 75, 105, 220), which perform an orientation function in the interpretation of psychological terms, concepts, principles, and procedures.

Biographical directories in psychology—Two volumes of the *Psychological Register* (147), a biographical and bibliographical directory of American and foreign psychologists, appeared in 1929 and 1932, respectively. The 1932 volume included 2,400 psychologists from forty countries. A projected first volume is to include psychologists who had died before the inauguration of the series, extending back as far as the Greek scholars. For more recent information, the yearbook of the American Psychological Association may be consulted, although this annual publication includes only the name, training, position, field of instruction, and major research interests of each individual. The 1942 yearbook lists 713 members and 2,518 associates. *American Men of Science* (45) contains the biographies of a number of the more eminent psychologists. Many of the previously listed educational and general directories include information concerning certain psychologists, especially those engaged in teaching educational psychology or serving in administrative positions. The three-volume *History of Psychology in Autobiography* (146) consists of extended résumés of the lives and works of selected psychologists, most of whom are living.

Guides to Literature and Data in Other Social Sciences

Certain of the general educational guides described earlier in this chapter contain considerable material of interest to workers in other areas of the social sciences. This statement is especially applicable to the *Encyclopedia of Educational Research*, the *Education Index*, the REVIEW OF EDUCATIONAL RESEARCH, the *Bibliographic Index*, and also the annual methodological summary in the September issue of the *Journal of Educational Research*.

The basic reference tool for the social sciences in general is the fifteen-volume *Encyclopedia of the Social Sciences* (189), covering the fields of anthropology, economics, education, history, law, philosophy, political science, psychology, social work, sociology, and statistics. Its purpose is to provide a synopsis of progress in these areas and a repository of facts and principles. It includes biographical articles and bibliographies.

The *London Bibliography of the Social Sciences* (128) is a valuable compilation of some 6,000,000 entries, arranged alphabetically by subject with an author index, and based on the holdings of nine London libraries. *Public Affairs Information Service* (175) is a comprehensive index of periodicals, books, pamphlets, and other materials, particularly those with emphasis on sociology, economics, and political science. It is published weekly and cumulates five times a year and annually. *Social Science Abstracts* promised to solve the indexing and abstracting problems of the social science subjects but could finance itself for only four years, 1929-32. The result is four volumes plus an index. Much of the pamphlet material indexed in the *Vertical File Service Catalog* (216) is pertinent to the social science fields. Much social science material is indexed in the general periodical guides.

The titles of certain journals dealing with the social science fields may be located in the sources described in the section on guides in education. The index volume of *Social Science Abstracts* contains a long list of the journals represented. The yearbook of the Educational Press Association of America includes the titles of the social science journals of most interest to workers in education.

Other useful tools in the social sciences are a compilation (115) of research guides and references and a bibliography (57) on methods of research. The comprehensive guides to published books and to theses described in the section on education may be used for canvassing such materials in the social sciences. In addition, certain continuing or serial guides to theses in sociology and in history are published annually: doctors' and masters' studies under way in sociology (8), graduate degrees conferred in sociology (8a), and doctorate dissertations in progress in history (6).

Guides to special areas and problems of the social sciences—Especially extensive guides have been prepared for certain subdivisions of the social sciences: bibliographies in history (20, 55, 67, 107), dictionaries of Ameri-

can biography (110) and of American history (1), and a guide to materials in political science (34). Dictionaries of terms in sociology (157) and in social work (240) are available. The publications of the University of Chicago faculty in sociology were listed by Wirth (231).

The annual census of social research (24) conducted by the American Sociological Society uses the subheadings of social psychology, history and theory, methods of research, social statistics, social biology, sociology and psychiatry, human ecology, rural sociology, educational sociology, community problems, sociology and social work, the family, sociology of religion, criminology, and political sociology.

Social science directories and yearbooks—The social sciences are well equipped with directories and statistical and current events yearbooks. The annual educational directory published by the Office of Education includes a useful list of educational and social directories and yearbooks, as well as a compilation of educational, civic, and learned associations in the United States. A more extensive handbook (149) lists the scientific and technical organizations of both this country and Canada. Two surveys (80, 153) of organized research in the social sciences are now out-of-date but may prove useful for certain purposes.

There are directories of social work agencies (193), political leaders and programs (163), and municipal officers and activities (141, 142). The social sciences are well represented in the new *Biographical Directory of American Scholars* (44). Four of the widely used annual handbooks of information are the *World Almanac* (236), *Statesman's Yearbook* (197), *American Yearbook* (11), and *Statistical Abstract of the United States* (209). Four of the better known encyclopedias publish annual supplements (12, 30, 151, 237).

The biographical directories listed earlier in this chapter include many of the leading workers in the various social science fields. The *Encyclopedia of the Social Sciences* and the *Dictionary of American Biography* contain much biographical information concerning the workers in these fields.

Developments in Historiography

Education, like most fields of research, has depended primarily on publications in history for knowledge concerning the historical method of research, including techniques for exploration of sources, criticism of documents, and interpretation. The guides to the historical literature have been listed in the preceding section concerned with social science guides. The purpose of this discussion of historiography is to review briefly the major writings on the historical method as a research approach, rather than to deal with studies of the content of history as such. Research in the history of education and in comparative education has been summarized in other numbers of the REVIEW (50, 68), while the historiography of three years ago was characterized briefly in the December 1939 issue of the REVIEW (88).

The two-volume work by Thompson (206), published in the fall of 1942, is the most comprehensive review of historical writing in print, covering the period from earliest antiquity to the outbreak of the First World War, although no living historian is included and by intent no American writer is mentioned. In surveying the changing conceptions of history and the various fashions of writing it, Thompson fitted each author into the general intellectual background of the age represented and assigned to each writer his place in the development of the contemporary historiography. Barnes, in a single volume (17), appears to have been the first to attempt a history of historical writing for substantially the entire period of recorded knowledge, with the result that parts of his book read like a roll call of historians or a running bibliography. However, Barnes's plan of characterizing the intellectual background of each major period, of showing how the historical literature of each era is related to its parent culture, of indicating the dominant traits of such historical writing, and of identifying the individual contributions of the chief writers of each period has definite advantages by way of synthesis over individual literary essays on a group of historians or over any encyclopedic bibliography of historical writing. Shotwell (192) dealt with early records and evaluated in detail the contributions of Jewish, Greek, Roman, and Christian historical writings. Shotwell has planned a second volume to cover the period from early Christian times to the present.

A number of other histories of history cover more limited areas. Kraus (121) provided the first survey of the whole field of American historical writing. Three recent volumes of essays in historiography, written by former students of particular institutions, are significant: two series in American historiography (81, 106) and one dealing with selected historians of modern Europe (186).

Among the recent manuals directed chiefly toward the needs of beginners in historical writing, Nevins' *Gateway to History* (150) is especially comprehensive, with a multitude of interesting illustrations drawn largely from American history and biography. Kent (117) offered advice to the undergraduate senior and beginning graduate student in history in an attractive, forceful style. Good's briefer analysis (86) of selected problems of historical criticism, interpretation, and writing synthesized points of view and examples from a considerable number of full-size treatises in historiography. Other fairly general discussions of the writing of history are those by Hulme (104), Kellett (116), Oman (154), and Taylor (203).

Varied approaches, philosophies, and interpretative concepts in historical writing are represented in the literature of historiography during recent years. Among the more comprehensive treatments are discussions of history or the historical method in relation to biography (111), culture (185, 219), economic forces (98, 124), liberty (56), materialism (77, 94), science (135, 182), social science (168), and theory and philosophy (155, 205).

Space permits mention of only the more extensive applications of the historical method during approximately the past decade to psychology and social science. Dunlap (66) characterized a large number of historical treatises (old and new) in psychology under the headings of topical surveys, surveys of periods, and expositions of the views of particular men or groups, source books, biography, and general histories of psychology. Selected, comprehensive histories of psychology are those by Boring (23), Flugel (79), Murchison (146), Murphy (148), and Spearman (196). Within the past few years histories have been written for several areas of the social sciences: anthropology (159), economics (112), social thought (18, 73), and sociology (103).

This brief review of the literature of historiography suggests the possibility of yet another step in historical writing—"a history of the histories of historical writing." In the course of human affairs events have transpired, then records of events have appeared, next the history based on such documents, considerably later the discussions of historical method or historiography, and recently the histories of historical writing.

Summaries of Legal Research

Legal research in education is a special application of the historical method. The documentary sources utilized are (a) statutory law (constitutional provisions and legislative or statutory enactments) and (b) case or common law (principles applied by the courts in deciding issues not covered by statutory law). Legal research shares with the historical method in general similar techniques for exploration of the sources, criticism of documents, and interpretation.

During the past three years, 1940-41-42, the annual *Yearbook of School Law* (54) has continued as the outstanding publication in this field, with its contents devoted primarily to a narrative topical summary of decisions of the higher courts in all states of the United States in cases involving school law, as reported during the preceding year. This yearbook also summarizes the current doctors' theses in school law and lists the masters' theses in this area. Chambers (48) has tabulated the frequencies of doctors' theses on legal aspects of education in terms of the thirty-three sponsoring institutions and by years from 1919 to 1939 inclusive.

The major textbook publication in educational law for the three-year period is the volume by Hamilton and Mort (96), which is a combined textbook and casebook directed especially toward the problems of educational administration. Chambers (47) has extended the 1936 volume, *The Colleges and the Courts* (72), by reviewing the judicial decisions regarding higher education in the United States from 1936 through 1940.

During recent years the policy of the REVIEW OF EDUCATIONAL RESEARCH has been to discuss the legal aspects of an educational problem in the issue where other phases of the same problem are considered, rather than to devote a separate number of the journal exclusively to school law. Within the past three years parts of certain numbers of the REVIEW have

dealt with the legal phases of school organization and administration (179), finance and business administration (49), planning and constructing school buildings (31), the status of teachers (221), and research literature (53).

Documentary Reproduction

Microphotography within the past decade has become the major method of reproducing research materials and has brought about for the historian a revolution in methods of work second in importance only to the development of printing (76). The recency of the development of the several techniques of documentary reproduction, especially microphotography or microcopying, is indicated by the appearance in 1936 of Binkley's manual (22), which is the first detailed account of the various modern methods of reproducing research materials. In a sense, this manual is the parent of the *Journal of Documentary Reproduction* (113), since one reason for founding the journal in 1938 was to continue and keep up to date Binkley's pioneer work. Parts of the manual have been superseded by later and briefer publications but it is still the only basic reference volume for the subjects covered. Developments of 1936 and 1937 are covered in the two volumes (176, 177) that report the papers presented as microphotography symposia at the 1936 and 1937 conferences of the American Library Association.

There are four major uses (27, 122, 170, 201) of microphotography in furthering the work of scholars and research workers:

1. Negatives of materials not available in local libraries or in any single library may be made in many distant places and combined into a complete collection or series; for example, a newspaper or journal series or some other periodical collection.
2. Materials from distant libraries that cannot be visited, particularly collections in foreign countries, can be reproduced for local use.
3. Original publication of research, such as doctoral dissertations, is possible. University Microfilms publishes at intervals a volume of abstracts (134) of doctoral theses that are available in complete form on microfilm. Power (169) has outlined the problems and procedures involved in publication of theses by microfilm. Paul Monroe's work (136, 137) on the history of education combines the process of printing (Volume I, the textbook) and microfilm (Volume II, a collection of readings from the documents and source materials referred to in the textbook).
4. Preservation of documents that face disintegration, destruction, or damage through the ravages of time, wear, fire, or war. The space saved in the case of bulky materials, such as newspapers, is considerable; a filmed volume on a newspaper occupies approximately one-fiftieth of the space of the original.

The rapidity with which the work of microcopying has progressed is evidenced by the new *Union List of Microfilms* (160), which includes 5,221 items. The editorial committee in charge of this list hopes to issue annual supplements to keep the compilation up to date. Descriptions of the microcopying projects of individual libraries or organizations are available in the literature (76, 118, 201). Stewart (200) outlined fifteen problems to be solved together with recommendations for improving the uses of microphotography for scholarly purposes.

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CHAPTER II

Analytic, Synthetic, and Diagnostic Studies of Individuals¹

RUTH M. STRANG

METHODS OF STUDYING PERSONALITY have far broader applications today than ever before. They are essential to effective war effort and to the implementation of democratic principles. Prediction is necessary in the placement of personnel in the military services and in the selection of personnel in government and industry. In the problems of postwar reconstruction a knowledge of the unique contribution each person can make will be basic to the effective functioning of a democratic society.

Theories of personality may either be derived from novel variations in methodology, or they may dictate the methods of study employed in a given research. In the former instance, new light may be thrown on the structure and organization of personality; in the latter instance, the theory may be extended or clarified. Various theories of personality are represented in the publications of the last three years, but the most significant advances have been in the direction of study of the inner organization and the uniqueness of personality.

Persistence and Limitations of Paper-and-Pencil Tests

In his 1940 review of trends in clinical procedures and psychotherapy, Watson (80) noted the marked decline in interest in paper-and-pencil personality tests. Yet in spite of the skepticism regarding these instruments as repeatedly expressed by clinical workers, the experimental evidence of their lack of validity, and the arguments against this method of assessing personality as summarized by Vernon (79), new inventories and scales are still being devised, each with some unique and commendable feature.² Although the paper-and-pencil tests have some value as screening devices for detecting maladjustment in groups, as approaches to the interview, and as a basis for clinical study of individual responses and patterns of responses, interest in these instruments is being supplanted in recent literature by more enlightening and more valid approaches.

New Uses of Familiar Instruments

The use of definitely structured material such as standardized tests has certain qualitative possibilities. These qualitative aspects are emphasized

¹ The author is indebted to Margaret McKim for assistance in locating and reviewing references in the section on "Diagnosis of Difficulty in School Subjects."

² See Chapters VI and VII of this issue of the Review for further discussions of means of assessing various human traits or abilities.

in the administration of the Bellevue-Wechsler intelligence test (81). For example, the way in which a subject defines the words on the vocabulary test tells a good deal about the "quality and character of his thought processes," his cultural milieu, and schizophrenic tendencies. Observation of a subject at work on the object assembly test reveals something about his thinking and working habits, ability to work toward an unknown goal, persistence in completing a task, and sometimes artistic and mechanical ability. Porteus (64) recognized similar possibilities in the maze tests, offering as they do relatively great latitude of response to the subject and thus providing "particularly fertile material for some aspects of personality diagnosis." Gerlach (27) made a contribution to methodology in her comparison between psychometric pattern as indicated by the Stanford-Binet and Cornell-Coxe quotients and asocial and aggressive personality types as found in case histories.

Another example of new uses of old tests for personality diagnosis is the new scoring keys for the Strong Vocational Interest Blank. Tussing (78) reported that the validities of the keys in the areas of home, health, and emotional adjustment were low, but that self-confidence and sociability could be predicted fairly accurately by this method. Sheviakov's work (72) is another example of the clinical treatment of a psychometric technique. Instead of merely taking the items on the interest test at their face value, Sheviakov grouped and studied the responses in various ways and was able to construct an apparently valid personality picture of each subject. The diagnosis of personality through a study of the relationships between tests or parts of tests and through attention to the qualitative aspects of a person's responses is a promising development, probably stimulated by the success of the clinical treatment of subjects' responses to unstructured situations.

Personal Documents and Self-Analysis

The most important contribution in this area is the historical survey and evaluation of the critical literature and experimental studies made by Allport (3).

The personal document may be defined as any self-revealing record that intentionally or unintentionally yields information regarding the structure, dynamics, and functioning of the author's mental life. (3, xii)

There are various forms of "first-person human documents" ranging from personal accounts, with no checks or technical aspects, to critical and experimental studies. Included in this category are autobiographies, questionnaire responses, verbatim recordings, diaries, letters, and expressive and projective documents. Allport found personal documents useful in research, in teaching, in the construction of questionnaires and typologies, and in social psychology. In comparing the advantages of personal documents with their disadvantages he found most of the latter irrelevant or trivial.

A high point in the intentionally revealing personal document is represented by the self-analysis of "Clare" reported by Horney (39). In this case the procedure by which a patient may not only let her thoughts, feelings, and impulses emerge, but also use her critical intelligence in their interpretation, is minutely described. Such a document reveals the "why" of behavior as the patient sees it in her effort to effect a better adjustment. The value of such a self-analysis for research on the springs of conduct is obvious.

New Emphases in Observation

The technique of observation was so comprehensively reviewed by Jersild in the December 1939 issue of the *REVIEW* that little need be added here about this important instrument of scientific research. Perhaps the chief developments during the past three years have been its application on the college level, whereas formerly the vast majority of investigations were in the preschool field; and more use of the method as part of a unified approach to the study of the individual as a whole. Jarvie and Ellingson (41) described in detail, with many examples, the recording of behavior and the interpreting and implementing of the "anecdotal behavior journal" in their institution. McCormick (53) concluded from his experience with anecdotal records in the secondary schools of Springfield, Missouri, that this form of observation "has proved to be a feasible and useful technique" in the public school. An example of the clinical diagnostic use of observation was described by Brown (13) who used an experimental situation in which to observe the reactions of psychiatric patients to thwarting. He found a continuum of reactions which suggested to Watson (80) a possible "objective analysis of psychoses which are now measured only with adjectives like 'mild' and 'severe.'"

The most pervasive use of observation during this three-year period was reported by Lerner and Murphy (51). In their research observation was the basic method not only in natural nursery-school situations, during the intelligence testing and the pediatric examination and with the music teacher, but also in a variety of experimental situations. The emphasis in all these observations was on the "how" and the "why" of behavior. Every activity carried on in the nursery school was considered as an opportunity "to understand what it must feel like to be this 3- or 4-year-old, and . . . to help children to be their most effective selves" (51: 247).

Single-Aspect Approaches

The approach to personality through a single aspect might be called the "flower-in-the-crannied-wall" technique. It is true that an individual's pattern of personality may be revealed through his handwriting, his gait and other expressive movements, his speech (70), his free associations (30), and his sense of security (69).

The biological basis of personality and the chemical substratum must also be recognized. "Certainly all individuals cannot respond similarly

to exactly the same experiences. This fact in itself demands analysis and explanation" (73). Kahn (46) advocated an endocrine examination to determine whether a flyer's symptoms of tenseness and nervousness, insomnia, and psychomotor tension are due to maladjusted endocrines or to hereditary structural and physiological weakness of the nervous system. Methods and instruments used in studying anatomical, biochemical, physiological, and medical aspects of adolescent development are described in detail by Greulich (32).

The "Interpersonal Relations" Approach

The definition of personality as a person's "social stimulus value" naturally leads to a methodology involving classmates' or associates' opinions or ratings. Using a modified form of the "guess who" technique, Tryon (77) was able to make especially enlightening sketches of individual children who received extremes of scores derived from classmates' opinions. Jennings (42) advocated the study not only of "the individual's emotional-social expression choice and rejection of others but similarly the expression of other persons toward him." Bonney (12), Zeleny (84), and many others reported sociometric investigations in *Sociometry* during the past three years. The study of the individual as a social atom throws light on such problems as the choice process and patterns, on the characteristics of persons in isolated or near-isolated positions as contrasted with individuals in leader positions, and the consistency of the "internal structure" of the social atom (42).

Developmental Approaches

The genetic approach to the study of personality need merely be mentioned here because the December 1941 issue of the REVIEW dealt fully with the topic *Growth and Development*. Since changes in structure are closely correlated with changes in function, the clinical study of development makes an important contribution to the study of personality. This point of view is exemplified in *Developmental Diagnosis* by Gesell and Amatruda (28) and by Campbell and Weech (19) in their attempt to arrive at a mathematical description of certain aspects of a child's development against the background furnished by his peers.

The Case Method

Olson's review of the case method in the December 1939 issue of the REVIEW opened up a wide field of usefulness in "the establishment of professional practices and scientific generalizations." His emphasis on the value of case studies for administrative information, for the evaluation of programs, for curriculum and instruction, for illustration and validation of statistical results, and for scientific generalizations was an original and significant contribution.

The three most significant trends are (a) the attempts to standardize and to quantify case studies, (b) the use of case studies in the prediction

of personal adjustment, and (c) the application of statistical method to the single case. None of the statistical methods—statistical treatment of each item or factor as an independent unit, partial and multiple correlation, factor analysis, matrix algebra—have been wholly satisfactory. Burgess (17) reviewed four possible procedures: (a) intuitive generalization, (b) analysis of the case in all its individuality, (c) prediction by way of typology, and (d) analysis of the data according to fourteen factors that seemed to be dynamic. After applying the fourth procedure, Burgess questioned “whether a scientific method of analyzing factors will be superior, or even equal to the intuitions of persons gifted with deep understanding of human nature” (17:348).

The use of case studies in the prediction of personal adjustment is most thoroughly reviewed by Horst and collaborators (40), with the conclusion that case study data are definitely relevant for prediction. Stouffer (74) suggested a fusion of the intuitive and the statistical approaches: the intuitive selection of variates or configurations which the investigator thinks important in an individual and the comparison of this dynamic configuration with that of other individuals whose success or failure is known or with time-sequence records of success and failure within the individual case. The study of cases, according to Cottrell (20), “is aimed at isolating syndromes and typical personality patterns which experience has shown to be correlated with certain resulting behavior, problems in adjustment, success or failure in some activity” (20:369). The study of cases involves the three steps of synthesis, genesis, and prediction: (a) how one views his life situations; (b) how one came to have such a point of view; and (c) what one’s attitudes and overt responses are most likely to be under specified circumstances.

The use of prediction as an approach to the study of personality as a whole was suggested some years ago by Barbara Burks and facetiously called the “He Would” technique. More recently F. H. Allport and Frederiksen (1) applied this method with college students as experimenters and subjects. Their predictions of responses which acquaintances would make to a verbal dilemma were only slightly better than chance, but would probably have been much higher if “the teleonomic pattern had been successfully predicted.”

The application of statistical methods to the single case introduces “a new conception of a ‘population’ for statistics—a population of events and traits within the boundaries of one person” (3). By dividing material on an individual case into incidents which are then classified according to object discussed and attitude expressed, Baldwin (4) built the structure of an individual’s personality pattern which agreed closely with clinical judgments of the original material.

Projective Methods

The materials of projective methods present to the subject a stimulus-situation which is unfamiliar or “unstructured”; in responding to this

situation he reveals the way in which he organizes experience, and thereby the skilful investigator gains insight into the subjects' "private world of meanings, significances, patterns and feelings" (25). This is the essence of the various projective techniques. They constitute the chief method thus far evolved of studying the individual as a dynamic whole. The most widely used of these techniques is the Rorschach test. A great increase in interest in the Rorschach test has been evident during the last three years. The *Rorschach Research Exchange* has been active in disseminating experience and mutual criticism and the *American Journal of Orthopsychiatry* has published numerous articles on technical aspects of the Rorschach test. Two books, both containing extensive bibliographies, have recently been published giving details of administration, scoring, and interpretation. Klopfer and McGlashan (48) gave detail comparable to the Terman and Merrill manual for measuring intelligence and is an indispensable handbook for beginners. Bochner and Halpern (11) likewise presented the Rorschach test as a method of personality diagnosis and included helpful case records and protocols obtained from different types of persons. Continued research is needed on interrelations within a given individual response which help to identify brain injury, schizophrenia, and functioning intelligence; on the validation of the Rorschach method by "blind" interpretations and by comparisons with psychiatric case studies; on factors in personality on which the Rorschach method can be expected to give evidence; and on sources of errors in the Rorschach test (5). A recent development, stimulated by war needs, is the modification of the Rorschach method for use as a group test (34). Another important development is the increasing use of projective techniques as part of a comprehensive study of individuals.

Synthesis of Data from Comprehensive Sources

The culmination of fused theory and methodology is found in research in which significant data are collected by a variety of appropriate methods—psychoanalytic and projective as well as psychometric, developmental as well as cross-sectional, social case work, medical, observational, and the recording of the physical and psychological environment—and these data are synthesized into a structural personality pattern with "manifold roots and manifold effects."

Several major investigations have developed a methodology in the field of personality research along these synthetic and comprehensive lines. The Macfarlane "guidance study" (56) is making a unique contribution in the procedure of analysis of developmental material within each group of data and in the interrelations among different kinds of data. The Adolescent Growth Study reported by Jones (45) is another outstanding many-aspect developmental study of personality with more than usual attention to biological factors.

The adolescent study reported by Brown and other members of the Adolescent Study Staff (14) is exceptional in its being conducted under

public-school conditions and in its ingenious charts for synthesizing information about individual pupils—their goals and purposes, their social relationships, and the interaction among different aspects of their development.

Burks (18) described in detail her method of studying “identical twins reared apart under differing types of family relationships”—a method which “seems to offer promise of shedding some light upon the nature of traits themselves: their focal character, their variable modes of expression and their developmental transformations.”

This research is an excellent example of insightful analysis and synthesis of comprehensive data by means of which “trait organization” or “focus” within the individual may be studied.

Although the Harvard Psychological Clinic’s *Explorations in Personality* (36) was published a year previous to the limits set for this review, the reader should be reminded that this research represents the most thorough application of previously developed, and of original, subjective methods to the study of the personality of college students that has yet been made. It is the best single source of theoretical interpretation of the dynamic, unified approach to the study of “really significant congruences in personality.”

On the preschool level a similar approach has been made by Lerner and Murphy (51). This research is exceptional not only in the development of new projective techniques for use with young children, but especially in the interpretation of the children’s responses and in the focusing of observation on the “why” of their behavior. The experimenters attempted to organize the detailed records into a descriptive picture and to formulate hypotheses concerning the child’s temperament and “foci of emotional drive in terms of conflict, hostility, longing, guilt, pleasure, etc.” The hypotheses were then checked in terms of repeated evidence from the experiment itself, from subsequent experiments, by information from adults, and by further observation and experiments designed to test the hypotheses.

It is especially significant that this synthetic, comprehensive approach is being used in the selection of army officers in England and in Germany. The examination, according to an article in the *London Times* in June 1942, lasts for two days and includes not only the administration of individual tests, but also observation of conduct and attitude in a number of practical situations. The life history is considered important and emphasis is placed on qualitative aspects in the study of the total personality.

Diagnosis of Difficulty in School Subjects

The trend toward a comprehensive synthetic approach to the study of the individual, as already noted, is perceptible in the diagnosis of difficulty in school subjects. Olson (61), in his longitudinal growth studies of school children, presented reading as an integral part of total growth and cited instances of reading development as an aspect of the growth of the

child as a whole. The same concept of reading as "a function of the total growth of the child" was emphasized in the report of the third annual Conference on Reading sponsored by the University of Chicago and edited by W. S. Gray (31). Witty (82) likewise has been a vigorous advocate of the study of the whole individual as a basis for dealing with reading difficulties. His list of diagnostic procedures is therefore extensive: results of standardized tests, sensory and physiological functions, the interest inventory, diagnostic checklist of pupil's reading, observations of pupil and home, trait rating scale and reading evaluation, physical and medical data, and home information report. These should yield a wealth of information for an insightful analysis. The *Examiner's Diagnostic Reading Record for High School and College* (76) serves as both a guide to reading diagnosis and a convenient form for summarizing the breadth of information considered of diagnostic value.

The concept of reading patterns has not yet been as generally recognized as the concept of personality patterns. A recent research (75) represents a transition from the statistical analysis of masses of data to the insightful synthesis of case material in the field of reading. The case studies obtained in this investigation focused attention specifically on reading interests and responses and the reading case workers employed a procedure "somewhere between the standardized reading-test procedure and the flexible social or psychiatric case study method" (75:5). This combination of the interview and tests provided for observation by the examiner and some introspection by the subject as well as quantitative measures of reading speed, comprehension, and interests.

Much more emphasis has been placed on the use of tests than on the whole-child or reading pattern approach for diagnostic purposes. The readiness or prognosis test to detect weaknesses and to indicate teaching emphases necessary to prevent failure has been developed in both the fields of reading and arithmetic. According to Breuckner (16):

. . . the most important function of readiness tests in both reading and arithmetic is not *prediction* of success in the primary grades or at any other grade, but the *diagnosis* of factors likely to interfere with learning at any level of the school, at any stage of development, or in the study of any particular process or topic in the curriculum.

Other tests of broad and important reading abilities have practical diagnostic value. The test of critical thinking in the social studies designed for Grades IV, V, and VI by Wrightstone (83), the test of critical reading with reference to problem solving in the intermediate grades developed by Gans (26), the test of reading social studies materials in the high school by Martin (57), and of the reading of elementary algebra by McKim (55), both of the last two tests being based on typical reading demands made by their respective subjects—these are examples of tests of decided value in the diagnosing of reading difficulties.

Analysis of errors has long been a common method of diagnosing difficulty in arithmetic and reading. Bennett (6) analyzed 34,274 errors

made by retarded readers in the recognition and pronunciation of 237 basic words in a contest. She pointed out that errors do not occur in a haphazard way. Further advances in individual diagnosis through the analysis of errors may be made by studying patterns of errors and relating these to other factors such as conditions under which certain combinations of errors occur.

Other approaches to the diagnosis of reading difficulties are through the study of separate factors: vision (62), visual fatigue (23), eye-movements (29), level of aspiration (38), "organized comparisons between meanings" (66), mental ability (59), and reading interests and experiences (63).

Details of diagnostic procedures are supplied by the report by Hildreth and Wright (37) of the remedial reading class of eighteen pupils, by Preston's (65) case histories of forty pupils referred for remedial work after one to nine years of failure in reading, and by Durrell in his book *Improvement of Basic Reading Abilities* (24).

One of the most valuable diagnostic procedures in spelling is to ascertain a child's grade level on accepted spelling lists. Betts (7) provided such a list of 8,645 words for Grades II to VIII, giving the median grade placement, frequency in seventeen spellers, and grade range for each. Another spelling scale was published in the same year by Bixler (8). This contains a list of 3,679 words with tables indicating the percentage of pupils who can spell each word at each grade level from II to VIII.

It has been disappointing that more attention has not been given to the diagnosis of process such as Brownell (15) developed in arithmetic and Joseph Dewey in reading. Such diagnosis requires direct observation on the part of the investigator and introspection or verbalization on the part of the child. In this way the mental processes which lead to correct or to incorrect solutions can be ascertained. Two children may have the same score on a reading test but their reading ability may be quite different because of differences in their methods of work. In the individual testing situation these different patterns of methods of work may be diagnosed, for the examiner can ask the subject to explain how he solved the problems or did the tasks.

Significant Developments in Methodology of Studying Individuals

Among the most significant developments in methodology are:

1. The inclusion of additional sources of data in the study of an individual—the environmental setting, the situations in which responses are made, more use of unstructured and experimental material, observations directed toward the "why" of behavior and social interaction, and the increased use of personal documents.
2. Increased use of the genetic approach beginning with the young child and working forward rather than beginning with a maladjustment and working backward.

3. "Insightful" analysis and synthesis into a unitary structure of the comprehensive data collected.

4. The search for persistent, pervasive trends in personality that manifest themselves in specific behavior and are allied to conation, purpose, striving.

5. The cautious approach to any quantitative analysis of personality, with the recognition that the attempt at standardization may "disrupt dynamic patterns."

6. The attempt to predict from case study material.

7. The formulation of hypotheses concerning human personality from the study of individual cases, recognizing that although the single case does not discover a law, it does discover that there is a law, and that therefore the individual case has research importance.

8. The clearer recognition that appraisals of personality reflect the personality and training of the investigator and that the psychologist must therefore "himself become an instrument of precision."

9. There are individual differences in subjects with respect to their response to different methods, which may make one approach more appropriate for one person than for another person.

These trends represent progress in the study of the uniqueness of personality and in the diagnosis of maladjustment. They might well be applied to a greater extent in the diagnosis of difficulties in school subjects. Each trend implies a criticism as well as a commendation of the present status of diagnostic studies of individuals.

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CHAPTER III

Survey and Trend Studies

DAVID SEGEL

THIS CHAPTER is concerned with studies involving mass data which represent conditions or trends. The treatment is divided into (a) school surveys—state, city, and community; (b) large-scale testing programs; and (c) studies of language.

General problems of methodology in making status and trend studies are discussed by Segel (30) and by the Committee on Educational Research at the University of Minnesota (21).

Sears (28) pointed out that the survey is not itself a definite research technique but is rather the over-all interpretation and synthesis of facts discovered through more detailed research techniques. In considering the methodology of the school survey, two aspects should be emphasized: one is the application of new techniques found to be useful in gathering data in surveys, and the other is the general approach to the problem and the synthesis of the results. A survey properly conceived and executed is the most comprehensive and at the same time the most valuable of all research undertakings, because it deals with the broad aspects of actual field (or life) situations.

State School Surveys

The Regents' Inquiry into the Character and Cost of Public Education in the State of New York (1, 6, 10, 11, 17, 20, 25, 26, 32, 33, 39, 40, 41) set up first of all a general objective: to discover any failure of the New York State school system to meet the needs of youth. This general objective was broken down into workable units of inquiry, such as the needs of youth in occupational, civic, or recreational areas.

The survey did not stop with examining directly the school program, as is customary in school surveys, but also examined the effect of the school on former students and on the out-of-school activities of students. Two thousand former students of the high schools of the state of New York were interviewed regarding their major problems, attitude toward their present jobs, source of any advice received in regard to vocations, reading activities, club activities, movie attendance, training being received on the job, and hobbies. The information obtained from the employees was concerned with the initiative shown and other evidence of satisfactory work. The data were considered in relation to the curriculums that the young people had followed while in school. Through this type of analysis there was a definite attempt to correlate the conditions of school environment with adjustment in later life.

This survey exemplifies the following desirable steps:

1. Setting up objectives of the survey.
2. Determining the types of investigation which will secure data bearing on the objectives of the survey.
3. Gathering primary data through whatever instruments are most pertinent. This step involves the investigation of the school and its program, and also of the product of the school.
4. Synthesis: studying the interrelationships of various data gathered.
5. Formulation of conclusions regarding needed changes in the school system.

Another type of state survey is the study by Mort and Cornell (23). This study dealt with the adaptation of school practices to changing needs in nine phases of work. Critical innovations were the kindergarten, reorganized high schools, special classes, homemaking for boys, adult leisure classes, extracurriculum activities, elimination of final examinations, integrated curriculums, and supplementary reading. The degree to which these practices existed in the schools of Pennsylvania at different points of time were studied through questionnaires sent to all first-, second-, and third-class school districts, and a one-tenth random sample of the fourth-class districts of the state. The growth throughout the state in each adaptation was traced.

An interesting part of this report is a supplement describing the research methods used in the study. "The authors have attempted to avoid limitations of particular techniques, methods, and points of view, and have moved forward in their study with an effort to make use of such tools as best served the field. In our own minds, we feel that we have avoided the pitfall of being drawn into polarization of point of view with reference to the whole and the part method, the mass descriptive approach versus the limited case study upon carefully isolated factors, or the statistical versus the non-quantification approaches. . . . We realized that along with methods of well-established utility we have employed some of doubtful or uncertain reliability and validity. All this was done with the purpose in mind of utilizing all tools at hand toward the end of examining a very intricate and dynamic complex, the process of adaptation" (p. 435-36).

City School Surveys

Both the St. Louis (35) and the Pittsburgh (36) surveys established new trends in city surveys through the use of several new techniques in getting at civic and social growth in school children. In the St. Louis survey, for example, several of the newer tests of social and civic competence were given. An important comparison was that made between the scores on these tests and the number of semesters of work in the various social studies that the pupils had taken. Among the instruments used for this purpose were *Judgments Characteristic of the Socially Competent Person*; *Test of Critical Thinking in the Social Studies*; *What Do You Think?* *Ordon Social Science Test*; and the *Melbo Social Science Survey Test*.

An important change in the use of measurement in city surveys is illustrated by the Pittsburgh survey. Tests of achievement in subject fields such as reading, arithmetic, and English, were not given in the survey, because the Research Division of the city schools had data from such tests available in its files which were used by the survey staff. This survey took an important step by investigating the extent to which test results were used by the schools to individualize instruction and provide individual guidance. A school survey should not only determine general levels of competence but also see if the schools are using all the facilities possible to determine individual differences and adapt their instruction and guidance accordingly. An excellent analysis of the research procedures of the St. Louis survey has been made by Caswell (3).

Surveys are using new techniques of evaluation but still suffer by the general practice of uncontrolled observation of classroom work. Comprehensive school surveys should take advantage of the new instruments of general evaluation being evolved for secondary and elementary education, such as those developed by the Cooperative Study of Secondary School Standards and those developed in the Research Division of the state department of education of New York.

The Columbus, Ohio, survey of health and physical education activities (12) is an excellent example of a survey of an important area of a school's activities. A new method of getting at the mental health of students was tried, thru employing the following criteria:

1. The child is considered a chronological misfit if his age differs from the median age of his classroom group by more than one year.
2. A child is regarded as an intellectual misfit if his mental age is more than one year below or more than two years above the median for his own classroom.
3. A child is regarded as an academic misfit if his reading achievement is more than one year below or more than two years above the median of his classroom.
4. A child has a reading disability if his reading age is more than one year below his mental age.
5. A child is regarded as a school failure if he is repeating his grade (or half-grade).
6. A child is regarded as a truant if he has been a truant from school during the current term.
7. A child is regarded as a behavior or personality problem if he rates low on one of the better behavior rating devices, or the *Personal Index*, or the *California Personality Test*.

In order to be considered as a mental hygiene case the child must have failed in two or more of these criteria.

Community (Sociological) Surveys

In community, or sociological, surveys as contrasted with educational surveys, the problem of adequate sampling looms large. This is true because it is more difficult to sample adequately a miscellaneous group of people, such as those in a town or rural area, than it is to study pupils already classified by ages and grades in school.

Jenkins (14) discussed this problem in connection with his study of the growth and decline of agricultural villages. His definition of an

agricultural village is a town between 250 and 2,500 in population, situated in a farm area, and largely dependent on the farming population for its continued existence. Since there are approximately 7,000 villages of all types in this population range in the United States it would be an almost impossible task to study all the agricultural villages. Jenkins chose for his study the villages used originally by the Institute for Social and Religious Research in 1924. These villages were selected by first making a rough count of the number of agricultural villages, thus giving the proportion of villages to be selected from each state or region. Within each area villages to be included in the study were selected by sociologists and others familiar with the area. Since the sample used was set up in 1924 a question was raised as to its representativeness in 1938 or 1939.

Terry and Sims made a cross-section study (37) of all aspects of a rural community. The study is largely a detailed and intimate description of the life of the community. Whereas in most social studies people are interviewed and documentary evidence is examined, in this survey the surveyors actually participated in the life of the community. The community was made to feel that the visitors were interested in what the community was interested. The writer feels that this method might properly be called the "life sample" method since the investigators lived short samples of time as persons in the community. As an illustration the investigation of the religious life of the community may be mentioned. The surveyor attended meetings as a visitor-participant. The church activities were in no case cramped by the pressure of the visitor. The surveyor sang the songs and took part in the services in the same way as any cousin or uncle visiting in the community would do.

Frederick and Geyer made a community survey at Battle Creek (8). The American Council on Education published a guide to community surveys (4).

Regional Testing Programs

Testing programs over wide geographical areas are carried on in a variety of ways and purposes. Some programs use general ability tests with high-school freshmen; more often the program consists of achievement testing for such purposes as motivation of better scholarship or teaching, evaluation of the curriculum, or to provide diagnostic measures for use in remedial instruction. A new emphasis on the guidance aspect of such testing programs is found in the new Iowa undertaking (19). This is based on the two following general objectives:

1. To enable teachers, administrators, and counselors to keep themselves more intimately and reliably acquainted with the continuing educational development of each individual pupil, in order that instruction and guidance may be better adapted to his peculiar and changing interests, needs, and abilities; and
2. To provide the school administrator with a more dependable and objective basis for the over-all evaluation of the total educational offering of the school, in order that any need for curriculum revision may more surely be brought to his attention, and that his supervisory efforts may be more wisely distributed.

The testing program set up to satisfy these two objectives would, according to the reasoning of the Iowa plan, be one which has the following characteristics:

1. The tests used should measure as directly as possible the attainment of the ultimate objectives of the entire school program.
2. All the tests should be administered, under standard conditions, to the entire student body.
3. The program must provide for the measurement of growth. This means that the tests should provide for periodic measurements with the same or with comparable tests.
4. The tests used should measure the more permanent changes produced in the pupils. For this reason it is planned to give the Iowa tests at the beginning of the year since no cramming can take place for such examinations and since it is after a summer vacation that permanent results of instruction show up best.
5. The test results should not be usable in the rating of individual teachers. Since the tests are given at the beginning of the year the results cannot be used to check on the efficiency of instruction of particular teachers or classes.
6. The test results should be available in a readily interpretable form. This means that scores from the various tests can easily be compared through comparable scores or through graphical profiles.
7. The measures derived must be highly comparable from test to test.
8. Each of the tests used must yield highly reliable measures of the abilities of the individual pupil.

The instruments devised for the testing in Iowa cover the following fundamental abilities of pupils in the secondary school: (a) the understanding of basic social concepts, (b) the ability to do quantitative thinking, (c) the ability to write correctly, (d) proficiency in the natural sciences, (e) the ability to interpret reading materials in the social studies, (f) the ability to interpret reading materials in the natural sciences, (g) the ability to read literary materials, (h) the ability to use important sources of information, and (i) the ability to recognize important word meanings.

The Illinois 1941 State Testing Program (7) was a cooperative program sponsored by the high schools and colleges of the state of Illinois to aid high schools in the guidance of seniors and colleges in their admission program. The American Psychological Examination and a special reading test constructed by the Board of Examiners of the University of Chicago were used.

Both the Iowa and Illinois State Testing Programs are voluntary. An important aspect of both programs is the provision made for mechanical scoring at a central point. This is important because a tabulation of the scores is necessary before norms can be made available.

The purpose of state department testing programs has been mainly accrediting of schools or promotion of pupils to higher institutions. There has been a tendency to get away from such purposes because the type of testing encouraged—testing specific subjectmatter as laid down in state courses of study—was not to be commended. An example of a new emphasis is that shown by the Examination Division of the state of New

York. In that state there is being gradually introduced a new system of tests based on fundamental abilities, such as reading and mathematics, the scores of which the schools are encouraged to use in instruction and guidance. This development in New York is something like that in Iowa already described.

Age-Grade-Progress Studies

The age-grade survey of Los Angeles County (19) made comparisons of age-grade status for the years 1929, 1933, and 1937. This study compared, in terms of percents, normally placed, over-age, and under-age students for the three years in the nonurban schools of Los Angeles County. The New York City report for the school year 1940-41 (24) included comparative figures of promotion and ages for most of the years 1925 to 1941. Age-grade-progress for 1940-41 was analyzed at length. The state department of education of New York (22) made a study covering the progress of pupils in rural districts from Grade VIII through high school, a period of five years. Some of the broader aspects of the maladjustment between the pupils and the school program were ascertained. This study is a trend study based upon two cross sections made at an interval of five years.

There is a general weakness in statistics gathered about children in that there is little uniformity in the standard set for normal school entrance or for different grades or periods of school life. This mitigates against comparisons of different geographical or political regions. The U. S. Office of Education, through its bulletin on age-grade-progress (31), is encouraging the standardization of age-grade-progress data.

Studies of Language

The study of language has increased considerably during the last few years. In general there appear to be three types of approaches in this field. The first consists of the consideration of the logical basis of language as a carrier of meaning, such as in Carnap's new book (2) and Korzybski's book (16). These authors studied meaning through building up another language to explain the original language. "By a semantical system (for interpreted system), we understand a system of rules formulated in a metalanguage and referring to an object language, of such a kind that the rules determine a truth-condition for every sentence of the object language, i.e., a sufficient and necessary condition for its truth." Carnap has expanded considerably the "metalanguage" suggested by Korzybski and has set up definite rules for using this language in analyzing declarative English statements. The metalanguage is a combination of symbols and English.

Another approach to the study of language is that illustrated by Fries (9) who studied intensively the language found in 3,000 letters of a federal government department. He first classified the writers into three social or class groups in accord with definite information including the

education and occupation of the writers and in some cases a special confidential report on the family. The language facts for the three groups of persons were examined for forms of words, the uses of function words, or the uses of word order. Upon the basis of his study, Fries recommended a new type of approach in the teaching of grammar.

The third type of language study is the statistical study of the occurrence of word meaning or of errors of language. Davis (5) noted that in counting errors in oral speech, the amount of such error can only be judged if the relative amount of error can be compared with the amount of correct speech. Davis made this comparison by taking actual transcriptions of the speech of a large number of children. Those interested in word counts should read Thorndike's analysis of word counts (38), which discusses the results of various types of approach. Knott (15) reviewed somewhat the same problem, as did also Seegers (29). Rinsland (27) studied the words from 100,212 separate writings of children in Grades I through VIII. The words were analyzed for the different meanings used. There are two weaknesses in the method: (a) Children hesitate to write words they cannot spell and may therefore leave out words they use orally. (b) The words children use may not necessarily be the words they should use or the words that they should know when reading. Stone (34) studied vocabulary based on children's words and Horn (13) reviewed research on adult vocabularies.

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CHAPTER IV

Experimental and Statistical Studies: Applications of Newer Statistical Techniques¹

PAUL BLOMMERS and E. F. LINDQUIST

THE LAST FEW YEARS have witnessed a gradual and rather belated introduction into research procedures in education of the many new and in some cases very important statistical techniques that have become available during the past two or three decades. While many of the educational applications of these newer techniques have been valid, not a few have evidenced a faulty understanding of the techniques or a failure to recognize the implications of the theoretical assumptions underlying their derivations. It is the purpose of this chapter to attempt a general appraisal of these applications from the technician's point of view. The chapter has therefore been organized with reference to techniques. Only as many studies have been cited with reference to each technique as were needed to yield illustrations of important prevalent errors and misconceptions, or, occasionally, of valid applications. In some of the studies cited the error may be of relatively minor consequence and in all other respects the study may be very competently conducted.

The treatment is divided into three general, somewhat overlapping areas: problems involving correlation, significance of differences between means, and analysis of variance and covariance.

Significance or Reliability of an Obtained Correlation Coefficient

Newer techniques for testing the significance or reliability of an obtained r have been largely ignored by research workers in education. Four instances were noted in which this application of the Fisher z -transformation was made (6, 12, 33, 55) to test the null hypothesis. While the z -function provides a satisfactory test of this hypothesis, the F -test

$$F = t^2 = \frac{r^2}{1-r^2}(N-2)$$

provides a somewhat more exact and conservative measure of the significance of an obtained r . No such application of the F -test was observed. In a fifth instance (18) the z -transformation was employed to establish the 5 percent-level confidence interval (fiducial limits) for obtained correlation coefficients.

¹ For other reviews of statistical methods see Chapters VII and VIII of this issue.

Averaging Correlation Coefficients

The Fisher z -transformation makes it possible to obtain an improved estimate of the population correlation by pooling estimates of the correlation based on several independent random samples drawn from that population. Four applications of this procedure were encountered (21, 25, 33, 40). For this procedure to be valid the estimates averaged must be based on random samples from the same population (or equally correlated populations). In some instances the technique concerned has been employed without regard to this condition. Rizzo (40) obtained intercorrelations for scores yielded by three different scoring procedures applied to three different tests for each of eight different grade levels. As nearly as could be told from the data presented, at least half of the differences in the intercorrelations thus obtained were significant. Yet Rizzo not only used the z technique to pool correlations for different techniques within a given grade-level and for different grade-levels within a given testing technique, but also for all grades and all testing techniques. A similar error was made in the second part of the study. It would appear that Rizzo has incorrectly assumed that the z technique permits the averaging of correlation coefficients in general, without regard to possible real differences between them.

McConnell (25) employed the z -transformation to average the intercorrelations between scores on the major subjectmatter subdivisions (physics, acoustics and astronomy, and chemistry) of a comprehensive examination in physical science. He also averaged the intercorrelations between the scores on the various "outcome" parts (vocabulary, knowledge of facts and principles, application of facts and principles) of this same examination. This procedure would be valid if one could assume that the correlations averaged were obtained from independent random samples rather than from the same sample, and if one could assume also that these correlations were all estimates of the same value. However, neither of these assumptions seems reasonable and the procedure is open to question.

Lannholm (21) reported strong evidence of real differences from school to school in reliability coefficients and also in validity coefficients for the same test. However, in order that he might obtain a general estimate of reliability and validity for the tests he was studying he made use of the z -transformation to average the coefficients for the various schools involved, commenting:

Since this method of averaging correlation values is not valid if true differences in correlation exist from one school to the other, the use of this procedure may be questionable in this case. Nevertheless, it is believed that the averages thus obtained represent perhaps the best possible estimate of the general validity of each of the different tests (p. 70).

The Significance of a Difference between Correlation Coefficients

The Fisher z -transformation was properly applied in a number of studies (3, 26, 29, 48, 52, 58) to test the significance of a difference between

correlation coefficients obtained from independent random samples. In some studies, however (4, 13, 25), this test was incorrectly applied to *related* correlation coefficients obtained from the same sample. Edgerton and others (13), for a sample of 288 men, obtained the six correlations between a total liberalism score and separate liberalism scores in democracy, economic relations, labor, race, nationalism, and militarism. The same six correlations were obtained for 149 women. Sex differences in these relationships were then tested by the Fisher *z*-test. In this application the samples are apparently independent and, if random, the test is valid.

These writers, however, go further. They present 129 correlations for men and state that hence there are 8,256 possible differences in correlation coefficients for men alone. Since it was not feasible to test each of these differences individually, the writers provided a table containing the significance ratios (exceeding 2) for differences between *r*'s based on samples of 288 cases. They then suggest that by means of this table ". . . the reader can estimate the significance of the difference between any correlations which he wishes to compare in this study" (p. 262). Inasmuch as the variables involved are related and all correlation coefficients are derived from the same sample, none of the tests of significance that a reader might choose to make by means of this table would be valid.² Even though all these correlation coefficients had been obtained from independent random samples the mass procedure suggested in this study would still not be valid. The fallacy involved in effecting such tests *en masse* may be appreciated by noting that if the 129 correlations were derived from independent random samples drawn from the same population (i. e., all estimates of the same value), some 400 of the 8,256 possible differences between them would be judged "significant" according to this procedure.

Significance of a Difference Involving Spearman-Brown Estimates

Several of the studies cited in the preceding section have been concerned with the validity of the Spearman-Brown formula for predicting reliability coefficients under circumstances somewhat different from those for which this formula was originally intended. Bruce (4), for example, obtained the grade point averages of 209 students who remained in college attendance for twelve consecutive quarters. She estimated the reliability of the grade point averages by correlating those earned by each student in two consecutive quarters. From this *r* the reliability of grade point averages over *n* quar-

² A test of the significance of the difference between related correlation coefficients of the type r_{y1} and r_{y2} both of which have been obtained from the same sample has been derived by W. G. Cochran. This test, which has never been published, is

$$t = \frac{(r_{y1} - r_{y2})\sqrt{N-3}\sqrt{1+r_{12}}}{\sqrt{2}\sqrt{1-r_{12}^2-r_{y1}^2-r_{y2}^2+2r_{12}r_{y1}r_{y2}}}, \quad df = N-3.$$

An equivalent test was independently derived by Hotelling. See H. Hotelling, "The Selection of Variates for Use in Prediction with Some Comments on the General Problem of Nuisance Parameters," *Annals of Mathematical Statistics*, 1940, Vol. 11, pp. 271-83.

ters was predicted by means of the Spearman-Brown formula. Since the data were available for the direct computation of the reliability over n quarters, the *obtained* r for n quarters was compared with the *predicted* r for n quarters by means of the z -test. This application of the z -test is not strictly valid because the *predicted* r and the *obtained* r are not here independent. Bruce was aware of this shortcoming and tried other methods of testing the difference concerned.

Remmers and others (10, 36, 37, 38, 39) have contributed a series of studies concerned with the hypothesis that a multiple-choice test having items with $2r$ responses is twice as long as a test consisting of the same number of r -response multiple-choice items, and that consequently the reliability of the $2r$ -response test may be predicted from the r -response test by means of the Spearman-Brown formula. Though the studies in this series are concerned with various types of measuring instruments and vary somewhat in approach, they are similar enough that a few descriptive comments with respect to one of them (10) will suffice for the lot. Denny and Remmers (10) divided some 1,000 high-school pupils into four groups. Each group was given the same 100-item multiple-choice vocabulary test, with the exception that the number of possible responses varied from group to group. That is, the test administered to one group consisted of 5-response items, that administered to a second group consisted of 4-response items, and so forth. For each form of the test the reliability coefficient was computed by the "odds-evens" method involving the use of the Spearman-Brown formula. From each reliability coefficient thus obtained the reliability for each of the other three forms was predicted by employing the Spearman-Brown formula in the manner suggested by the hypothesis being tested. Differences between the predicted and theoretical reliability coefficients were then tested by the z -test. Since the obtained reliability coefficients and the corresponding theoretical coefficients are based on independent samples, the test is valid so far as this consideration is concerned. Strictly, however, the formula for the standard error of z is designed for correlations computed directly from random samples, not for those estimated from obtained correlations by use of the Spearman-Brown or any other formula. It is interesting that in no case was the difference between the z 's as large as the standard error of the difference—a result one would hardly expect even though the hypothesis were known to be true.

On the basis of these results the authors wrote, "For vocabulary test items varying in number of responses from two to five it is concluded that the experimental data completely support the hypothesis" (p. 704). If the authors imply that they have *established* the hypothesis, they have violated a fundamental principle of statistical logic. No null hypothesis can be established on the basis of results from random samples. The sample data may be consistent with the null hypothesis and may establish its tenability as an hypothesis, but they do not completely support it. One may not conclude that there is no real difference simply because the obtained difference is not significant.

Intraclass Correlation

Two applications of intraclass correlation techniques were encountered (28, 34), both of which were concerned with the study of twins. Portenier (34) compared twelve pairs of twins with twelve pairs of siblings on a number of personality measures. For each of these measures the intraclass correlations were obtained for the twins and for the siblings. These r 's were transformed into z 's and the differences between these z 's for the twins and the corresponding z 's for the siblings were tested for significance. To find the standard error of these z 's the author used the formula

$\sigma_z = \frac{1}{\sqrt{n-3}}$. This is actually the formula for the standard error of a z arising from an interclass r , the proper formula for the S.E. of a z arising from an intraclass r being $\sigma_z = \frac{1}{\sqrt{n-\frac{3}{2}}}$. It should be noted that

in using the improper formula Portenier erred on the conservative side. Regarding the reliability of the differences obtained Portenier stated that none of the significance ratios exceeded 2.0, but that if any ratio greater than one is acceptable, certain of the differences are significant. This last standard is approximately equivalent to accepting the 32 percent-level of confidence as a criterion of significance, which is contrary to all practice. The most important point to be noted is that because of the small number of pairs involved (12 pairs) any demonstration of real differences between z 's (when 2.0 is taken as the critical value of the significance ratio) requires that the obtained difference be as great as .72. This condition illustrates the futility of attempting to demonstrate the presence of small real differences between correlation coefficients derived from small samples (21a).

Morgan (28) obtained certain measures of eye-movement performance in reading for a sample of artificial twin pairs, a sample of fraternal twin pairs, and a sample of identical twin pairs. The intraclass coefficients of correlation were reported for each of the three types of pairs on each of the measurements taken. The manner of computing the P.E. of the obtained coefficients was not reported and, although the necessary data were given, the writers were unable to duplicate certain of Morgan's reported P.E. values. The P.E. of the distribution of obtained intraclass r 's about the

true coefficient, ρ , is ordinarily given by $P.E._r = .6745 \frac{1-\rho^2}{\sqrt{N}}$ when the

number in each class is 2 and when N is sufficiently large. This formula is limited not only by the fact that it involves a population parameter but also by the fact that the distribution of obtained r 's about ρ becomes increasingly skewed as r approaches ± 1.00 . Since some of the r 's found were of considerable size, this study illustrates an application of the P.E. which is often virtually meaningless but which unfortunately is common in educational research.

Correlation Coefficients from Relatively Homogeneous Subsets

When a bivariate population is comprised of subpopulations such that the subpopulations are more homogeneous with reference to one or both variables than the total population, and such that the correlation between the variates is the same for all subpopulations, then, on the basis of random samples (groups) drawn from the various subpopulations, a best estimate of the common "within group" correlation may be obtained by the methods of analysis of covariance. Osborn (30) employed this procedure properly to estimate a number of correlation coefficients, such as those between performance on an achievement test and the shift in attitude toward a certain social issue resulting from a propagandizing treatment. His subjects consisted of the members of intact class groups selected from various school systems. On the grounds that attitude toward the issue concerned tends to be less varied within a school community than in the total population of school children, a given school may be regarded as a sample from a relatively homogeneous subpopulation. Hence, Osborn used the formulas of analysis of covariance to obtain the "within class" correlations, thus eliminating from the coefficients whatever effect between-school differences may have had upon them.

Kuder-Richardson Reliability Formulas

The use of the Kuder-Richardson formulas to estimate the reliability of a test is rapidly increasing. Andrus, Cronbach, and Hastings (2, 8, 18) each used the Kuder-Richardson Formula (20). Froehlich (16) presented a slightly different form of the Kuder-Richardson Formula (21). This particular formula is based in part on the assumption that all the items of the test are of uniform difficulty. Froehlich made a rough empirical check on the cruciality of this assumption by administering the five parts of the *Wisconsin Achievement Test* to 2,000 individuals. He obtained the reliability coefficients for each of the five-part scores and for the total score by both the split-halves procedure and the Kuder-Richardson Formula (21). The difficulty of the items on this test ranged 71 points on a 100-point scale with a standard deviation of 16. Yet the differences between the indexes of reliability were relatively slight, the largest difference being .058. Moreover, the two indexes correlated perfectly.

The Kuder-Richardson formulas are based on assumptions which are far from satisfied in any applications which have come to the reviewers' attention, and hence it is difficult to say what it is that the r 's thus obtained actually measure. Perhaps what they measure is better described as "internal consistency" than as "reliability," as the latter term has usually been employed. The Kuder-Richardson, the "odds-evens," and the "equivalent forms" techniques do not describe exactly the same characteristic of a test. There is a real need for further clarification of the issues involved in the choice between these techniques.

Testing the Significance of the Difference between Means of Independent Random Samples

Applications of the t distribution (students' distribution) to test the significance of the difference between means of independent random samples are becoming increasingly common (1, 6, 14, 15, 27, 32, 35, 54, 57, 59). Pintner (32) made extensive use of the t -test in studying the differences between normal hearing and hard-of-hearing individuals of various age groups with respect to certain measures of personality traits. The means which he thus compared were based on independent samples of varying size. On the whole his samples were large, so large in fact that in most instances it was necessary to enter the t -table for an infinitely large number of degrees of freedom. As a consequence the traditional procedure³ would in theory have been somewhat superior to the t -test⁴ because the latter assumes homogeneity of variance whereas the former does not.

According to Fisher (14a) the value of t yielded by the latter test tends sometimes to be increased by a difference in variance between the populations from which the sample is drawn.⁵ It would be well to distinguish more clearly between these two tests and between the assumptions underlying their use. The traditional test is generally to be preferred for large samples; for small samples the t -test must be used. A particularly serious error is that of employing the traditional procedure with small samples and interpreting the significance ratio thus obtained as though it were the t statistic. Wolfe (57), for example, used the traditional procedure in comparing a small group of average readers with a small group of retarded readers with reference to such factors as laterality, audition, vision, verbal association, and adjustment. She interpreted the critical ratios thus obtained as t 's, entering the t -table for seventeen degrees of freedom. Wolfe dealt with equal sized groups, in which special case the procedures yield identical significance ratios. However, the proper number of degrees of freedom is thirty-four rather than seventeen, since the groups compared each involved eighteen subjects. It is less likely that this error would have occurred had the proper formula for t been

$$^3 S. R. = \frac{M_1 - M_2}{\sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}}, \text{ where } \sigma_{M_1}^2 = \frac{\sigma_{\text{sample 1}}^2}{N_1 - 1}$$

$$^4 t = \frac{M_1 - M_2}{\sqrt{\frac{N_1\sigma_1^2 + N_2\sigma_2^2}{N_1 + N_2 - 2} \cdot \frac{N_1 + N_2}{N_1 N_2}}}, \text{ where } \sigma_i^2 = \text{variance of sample } i.$$

⁵ Suppose, for example, that $N_1 = 500$, $N_2 = 1000$, $S_1^2 = 32$, and $S_2^2 = 4$. Here $F = 8.01$ whereas $F_{.01} = 1.19$. With this large difference between both the sample variances and frequencies, the value of t based on these samples and for any difference in means will be 1.373 times as great as that of the significance ratio yielded by the traditional procedure. On the other hand if $est\sigma_1^2 = est\sigma_2^2$ the two procedures yield identical results regardless of the difference between N_1 and N_2 .

employed. Another instance in which the traditional procedure was employed and interpreted as t was found in a study by Vaughn (54). Here again, however, the groups upon which the comparison was based were equal in size and hence the results are valid.

The application of an estimate of error designed for use with independent samples leads to biased results when applied to samples which are not independent. Researchers working with paired samples have generally taken this fact into account. However, it has frequently been ignored by workers dealing with groups which have been equated with respect to some control variable by simply making the means and standard deviations approximately equal for the two groups. Young (59), studying the relative effectiveness of different lengths of practice periods, employed three procedures with reference to four phases of school learning. The twenty-three subjects which comprised each of the three experimental groups were closely matched with respect to age, intelligence, and initial ability in the particular phase of learning being considered. Young stated that the significance of the difference between group means was tested by the t -test. Recomputation of the reported probabilities of the t 's obtained for various differences between means showed that the t -test employed was that designed for use with independent samples. This particular test is not appropriate here.

Testing the Significance of the Difference between Means of Paired Measures

Applications of the t -test of the significance of the difference between means of paired measures are not common in the field of education (6, 9, 24, 25, 30). A particularly interesting application of this t -test is found in a study by Osborn (30). Osborn sought to determine whether the change in attitude toward a certain social issue was significantly less for individuals who had been taught to be on guard against certain techniques of propaganda. Osborn's subjects were the members of intact classes of school pupils selected from a number of schools. Each school yielded two classes, one of which was used as an experimental or "taught" group and the other of which was used as the control or "untaught" group. Osborn reasoned that, apart from the effects of the experimental treatment, the pupils in a single school would be relatively homogeneous in their attitude toward the issue concerned, and that hence the whole study had to be regarded as a sample of schools rather than as a sample of pupils. His analysis was therefore concerned with class means rather than with individual measures. Since the classes all involved approximately the same number of individuals the unweighted means were used. These means were paired by schools and the difference found for each school. The t -test for a difference between means of paired measures was then appropriately used to test the significance of these differences.

Simple Analysis of Variance

So that there may be no confusion in terms, it may be well first to describe briefly what we mean by "simple analysis of variance." Given a set of observations which may be classified into groups, the sum of the squared deviations of all observations from their general mean may be analyzed into two components. One of these is the sum (for all groups) of the squared deviations of the observations from their respective group means, the other is the weighted sum of the squared deviations of the group means from the general mean. Each of these components, divided by the appropriate degrees of freedom, will yield an unbiased estimate of a population variance, on the assumption that all groups were independently drawn at random from equally variable populations. On the further assumption that in these populations the observations are normally distributed, one may use the *F*-ratio between these two estimates of variance to test the hypothesis that the population means are equal. Any instance in which a test of this type is based on an analysis of variance into two components will here be referred to as an instance of "simple" analysis of variance, as distinguished from the more complex case in which the analysis divides into several components.

Stuit and Donnelly (51) compared the scores made four years previously on various aptitude and entrance proficiency tests by individuals graduating from college. In one phase of this study Stuit and Donnelly grouped measures of mathematical aptitude for these individuals into nine groups, according to the major field subsequently pursued, and applied the methods of simple analysis of variance to test the hypothesis that the group means were equal. This analysis was repeated four additional times, once for each of the three other aptitudes or skills measured and once for the composite of the four measures. Except for the fact that the assumption of normality was not satisfied—an assumption which is usually not crucial—this application seems sound.

Edgerton and others (13), Evans and Wren (14), Mellens (26), and Williamson and Bordin (56) employed analysis of variance when correlation techniques would have been more appropriate. Evans and Wren (14) placed 148 students into four groups on the basis of test scores. The grade point averages for these individuals were analyzed so as to yield a "between groups" variance and a "within group" variance. It was found that the mean grade point averages of these groups varied significantly. This study produced quantitative values for both variables, and yet coarse categories were imposed on the data in order to use the methods of analysis of variance. Such data, in general, are more appropriately analyzed by correlation procedures. The scheme of correlation analysis based on the unbiased correlation ratio set forth by Peters and VanVoorhis (31a)—the so-called Epsilon technique—is admirably suited to the analysis of data of this type. The Epsilon technique has the advantage of not only providing a test of significance equivalent to

that provided in analysis of variance, but also providing a readily interpretable estimate of the strength of the relationship. Where the assumption of linearity seems justified the ordinary product-moment correlation serves the same purpose.

Part V of the study by Edgerton and others⁶ (13) is of interest for another reason also. In one phase of the investigation simple analysis of variance was applied twice to the same data but with different groupings of the subjects. The variable analyzed was "liberalism" as measured by the Progressive Education Association's "A Scale of Beliefs." In one instance the subjects were grouped into six categories on the basis of the amount of their mothers' education; in the other the original six categories were combined into two coarser categories according to whether the mother did or did not attend college. A significant F was found in the second analysis but not in the first. This procedure is analogous to computing a product-moment r between two variables, and subsequently imposing a dichotomy on one variable and computing a biserial r for the same data. The effect of grouping errors might be to make the biserial r significant and the product-moment r nonsignificant, but the test based on the finer categories would ordinarily be considered the more dependable. For similar reasons the F -test based on the six categories would provide the better test of the null hypothesis in this study, and the test based on two categories seems redundant and pointless.

Lamson (20), by means of analysis of variance, reached interesting and most unexpected conclusions relative to differences between five fourth-grade classes in IQ and in educational age. She concluded that the five classes differed with high significance insofar as mean IQ's were concerned, but that they did not differ significantly insofar as educational age means were concerned. These conclusions resulted from a rather interesting error. In analyzing the IQ measures, Lamson obtained a "within class" variance of 48.92 and a "between classes" variance of 2.56. Obviously, the means of the IQ measures taken jointly do not differ significantly from class to class. The F -test need not, in fact cannot, be made since the variance to be tested (the "between classes" variance) is smaller than the error variance (the "within class" variance). Lamson, nevertheless, determined an F -ratio using the "between classes" variance as the denominator or error term and concluded that: ". . . the variation in IQ is larger than would be expected in similar samplings ninety-nine times out of a hundred as the result of chance factors. The composite group lacks homogeneity with reference to intellectual ability" (p. 177). A conclusion which might validly have been drawn from this F -test applied by Lamson is that some real factor had operated to make the differences between class means considerably smaller than would result by chance.

Only one application of simple analysis of variance to experimental

⁶ Part V was done by W. A. B. Schrader.

data was encountered in the educational periodicals checked. Lohmeyer and Ojemann (22) were concerned with the relative effectiveness of three methods of auditory presentation. A pre-test was given over the material presented and the three methods groups were equated in part with reference to this measure. This same test was used again as a final or post-treatment test, the criterion measures analyzed being the differences between corresponding pre-test and post-test scores. No allowance was made for the effect of equating groups, hence a simple analysis in this case affords a definitely biased test of the hypothesis that the methods of presentation are equally effective. Since the preliminary measures were available, an analysis of covariance might have provided an unbiased test of this hypothesis.

The *t*-Test as Used in Conjunction with an Analysis of Variance or of Covariance

Sometimes, in a simple analysis of variance of a sample consisting of several groups, it is desired to test the significance of the difference between the means of a particular pair of these groups. In general, it is defensible to use the *t*-test for this purpose only after the *F*-ratio of the "between groups" and "within groups" variances indicates that taken jointly the group means differ significantly. The research worker should guard against the temptation to apply the *t*-test to certain pairs of means (particularly those selected because they show a relatively large difference) when the *F*-test has already shown that the observed variation in the means is entirely attributable to chance. This mistake was made in a study by Rubin-Rabson (42). Long and Welch (23) and Evans and Wren (14) applied the *t*-test to selected pairs of means before applying the over-all *F*-test. A valid application of the *t*-test in such situations may be found in a study by Lohmeyer and Ojemann (22). An example of the *t*-test properly applied in conjunction with an analysis of covariance may be found in Spencer's study (50) dealing with the retention of orally presented materials.

Complex Applications of Analysis of Variance

The analysis of variance into three components is found in a study by Cast (7), which was concerned with the problem of evaluating different methods of marking themes. Cast submitted forty themes to twelve judges each of whom marked each theme by the same prescribed method. Cast obtained three independent estimates of the population variance, namely, an estimate based on the differences between themes (V_c), an estimate based upon the differences between judges (V_r), and an estimate based on the residual or remaining differences between the 40 x 12 ratings after effects due to themes and judges had been eliminated (V_e). Reasoning, then, that a system of marking which did not differentiate significantly between themes was valueless, Cast concluded that a significant $F = V_c/V_r$ is one

of the criteria of a good marking technique. He next reasoned that a good marking system does not differentiate between judges, and hence a significant $F = V_e/V_r$ would be indicative of a poor marking system. Finally Cast reasoned that a good marking system is one which reduces random errors to a minimum, and that, therefore, a significant $F = V_r/V_{total}$, where V_{total} is obtained by dividing the total sums of squares by the total degrees of freedom, would indicate a poor marking system. In this last step he made an error—that of trying to test an F -ratio between variances that are not independent of one another.

Cast repeated this analysis with three other schemes of marking using the same themes and the same judges, a period of approximately two months separating each marking. He ranked the schemes thus studied on the basis of the three F -ratios described—a somewhat questionable procedure in view of the lack of any evidence of the comparability of the F 's or of the reliability of the ranking. A similar form of analysis may be found in a study by Sells, Loftus, and Herbert (49).

A study by Owens (31) of intra-individual differences versus inter-individual differences in motor skills illustrates an unusual variety of applications of analysis of variance and other techniques, some of which seem as questionable as they are ingenious and interesting. Owens administered each of six tests of motor skills eight times to each of fifteen individuals, in an effort to determine the relative magnitude of (a) differences from trait to trait within the same individual and (b) differences from individual to individual for the same trait. Among other things, he analyzed the variance (T.V.) of scores obtained from seven administrations of a test of a motor skill into the "between administration" (R.V.), "between individuals" (I.D.), and "remainder" (error) components, and then indicated in terms of percents the contribution of each factor to the total variance. In his Table 1, for instance, he stated that 68 percent of the variance in "block packing" scores is due to differences between individuals, 16 percent to differences between administrations, and 16 percent to error. The contribution of individual differences was apparently obtained by deducting the error mean square from the mean square for individual differences, and dividing the result by the number of individuals. The contribution of administrations was presumably found by deducting the error mean square from the administration mean square and dividing the result by the number of administrations. (Owens does not state specifically what divisor was used.) These contributions were presumably then added to the error mean square and each expressed as a percent of this total. This procedure is commonly used in genetics (49a) to evaluate the contributions of various factors to variance, and may find rather wide applications in education. When based on a small number of categories, however, a percent estimate of this kind is likely to be highly unreliable and should not be interpreted too literally.

Owens in this fashion determined the percent contribution of individual differences to total variance for each of the six tests, and then averaged these percents to get an over-all measure of the relative importance of individual differences. He similarly analyzed the variance of the scores on all tests in all administrations for each individual into "between tests" (T.D.), "between administrations" (R.V.), and "error," and for each individual expressed as a percent the contribution of trait differences to the total variance involved. He then averaged these percents to secure an over-all measure of the relative importance of trait differences. He next tested the significance of the difference between these mean percentages and concluded, because the difference was not significant, that trait differences and individual differences are of the same magnitude. One cannot conclude, however, that because trait variations and individual variations represent equal proportions of different things, that they are therefore equal to one another. Individual differences were expressed as a percent of individual differences plus administration differences plus error. Trait differences were expressed as a percent of trait differences plus administration differences plus error. No explanation is given of how these sums can be considered to represent the same total variance (apparently one would have to assume that which is to be proved, i. e. that trait variations are equal to individual variations), while the figures given show definitely that they are not equal.

To summarize the analyses of the type first described, Owens totaled the sums of squares and degrees of freedom from the separate analyses for the six tests, to secure a table (Table 8) in which there are reported 78 degrees of freedom for "between individuals" and 72 degrees of freedom for "between administrations" (repetition). How one can have 78 degrees of freedom for "between individuals" in an analysis involving only 15 individuals or how on any consistent basis the 72 degrees of freedom are obtained for differences between administrations, are other mysteries that require explanation. Owens similarly summarized (Table 9) the data for the second type of analysis for the fifteen individuals, and in each summary table applied an *F*-test on the basis of the degrees of freedom thus obtained.

It should be noted that even though the percents obtained were comparable from the two summary tables, one may not conclude from a non-significant difference that trait differences and individual differences are of the same magnitude. To do so is to make the common mistake of attempting to prove a null hypothesis. Owens is guilty of this latter mistake at another point also when having tested the homogeneity of a number of variances, he says (p. 309) that, "In all cases, the value of *L* failed to reach over the 5 percent-level, which means that the variances within groups are the same" (p. 309).

Owens' study involved several other complex procedures which, because of space limitations, cannot be discussed here. On the whole, his study is commendable for ingenuity but is open to criticism because of inadequate

reporting of procedures and questions of technical logic. It would seem advisable that educational research workers feel their way slowly in becoming acquainted with the possibilities of analysis of variance and be content for a while with relatively straightforward interpretations of relatively simple applications.

Evans and Wren (14) stated that they applied “. . . analysis of variance technique with two criteria of classification, Thinking I-E (Introversion-Extroversion) and Miller Analogies scores . . .” (p. 51). The trait studied was scholastic achievement. Four classes were formed with reference to each variable by dividing the distribution of scores into fourths. Aside from the fact that partial correlation techniques might have been more appropriate, this study is cited because of the apparent pointlessness of one of the tests applied. On page 51, Evans and Wren stated, “When the variance within the Analogies . . . groups was considered, there was insufficient evidence to determine any difference in the scholastic achievement of the four Thinking I-E . . . groups.” This is interpreted by the reviewers to mean that the significance of the “between Thinking I-E quarters” mean square was tested with reference to the “within Miller Analogies quarters” mean square by the *F*-test. This further illustrates the tendency to give inadequate consideration to the terms used in an *F*-test. The denominator in all such tests must be meaningful as an “error” term with reference to the numerator—the hypothesis tested being the hypothesis that the numerator variance is entirely attributable to chance fluctuations of the type measured by the denominator.

Gabel’s study (17), which was concerned with the relative effects of definite and indefinite quantitative terms upon comprehension and retention of social studies material, illustrates a higher order analysis. The subjects were the pupils in four grades in each of nine different school systems. The total sum of squares was analyzed into “between modes of presentation,” “between grades,” “between schools,” and all possible interaction components. The triple interaction component was used to form the error mean square. The only effect tested for significance was the “between modes of presentation” effect, all other effects having been determined for the sole purpose of eliminating them from the error term.

In a study of the factors affecting the efficiency of inductive reasoning, Long and Welch (23) carried out an analysis of variance with reference to the three variables: “subjects,” “degree of abstractness,” and “number of antecedents.” They obtained all possible interaction terms and used the triple interaction variance as the error term. Both “abstractness” and “antecedents” effects were tested and found to be significant. Then, in order to determine the relative potency of these two factors, they tested the *F*-ratio between the “abstractness” and “antecedents” variances. Since the *d.f.* were the same for both variances this may have served a practical purpose in this particular case; this procedure, however, is generally invalid. A means of estimating the relative contributions of the various

factors to the total variance which may be used when an appropriate error term is available is that described in the preceding discussion of the study by Owens.

Rubin-Rabson applied the Graeco-Latin square design in a series of seven studies (41, 42, 43, 44, 45, 46, 47) dealing with memorization of piano music. The second study, which is typical of this series, was concerned with a comparison of massed and distributed practice. Nine subjects, nine selections, and three methods were involved. Each subject memorized the nine selections, each of the three methods being used for a different set of three selections. By means of nine "3 x 3" Graeco-Latin squares, Rubin-Rabson balanced the three method sequences for all nine subjects and at the same time balanced the compositions. Obviously the balancing of the method sequences served also to balance the methods.

The advantage in such situations of the Latin or Graeco-Latin square designs is that they permit the use of a method of analysis of variance, which recognizes by reducing the error term that the counterbalancing increases the precision. (Research workers using other counterbalanced designs have often incorrectly analyzed the results just as if simple random sampling techniques had been employed.) This advantage, however, is not obtained without a price. The balancing of certain of the variables precludes the determination of interaction effects, some of which may be of as much interest as the main effects themselves. Hence, the use of this technique involves the assumption that there are no real interaction effects present or other more complex assumptions. In terms of the study under discussion this is tantamount to assuming that whatever method works best for one selection works best for all selections, or that whatever method works best for one subject works best for all subjects, or that whatever selection is most readily learned by one subject is also the selection most readily learned by the other subjects. It seems unreasonable to suppose that such assumptions are closely satisfied in this particular situation, although they may be nearly enough met so that a pooled error term may serve adequately for a rough test of the main effects. Before adopting the Latin or Graeco-Latin square designs, therefore, research workers in education should consider carefully the assumption implied, namely, that there are no real interactions, and should consider also the possibility of using a factorial design that will permit an evaluation of possible interactions.

Rubin-Rabson, apparently employing a procedure similar to that used by Owens, obtained an estimate of the potency of each variable in terms of a percent of the total variability, and placed considerable emphasis upon this estimate in interpreting her findings. It should be noted that such a procedure is valid only when an appropriate error term is used. It is doubtful that the error term yielded from the data as they are arranged in Rubin-Rabson's design is appropriate for this purpose. Certainly with the small numbers of categories employed, these percent estimates are highly unreliable and should be cautiously interpreted.

A word should also be said relative to a variation introduced by Rubin-Rabson in the fourth study of this series (44), in which the methods were not rotated but were presented to all subjects in the same order. If this was really done, the "order" differences would be inextricably mixed or "confounded" with the "methods" differences. Rubin-Rabson apparently was not aware of this fact, since in analyzing her data she somehow obtained separate sums of squares for "methods" and for "order." Apparently she obtained the same sum of squares twice, in one case calling it the "methods" sum of squares and in the other the "order" or "sequence" sum of squares. If this is a correct interpretation of her statements, she thus deducted the intermingled effects of "methods" and "order" from the residual or error term not once but twice.

Studies Employing Analysis of Covariance

Most research workers in education are familiar with the "matched groups" type of experiment and are aware of the administrative difficulties involved in attempts to match groups of school pupils. Since the method of analysis of covariance offers a way of securing the same degree of precision without the administrative inconveniences of matching, it is surprising that this technique has not been more widely adopted by educational research workers. However, the reviewers were able to find only one published study in which this procedure had been employed. This is a study by Spencer (50), concerned with the retention of orally presented materials. In one phase of this study Spencer tried seven combinations of different frequencies and temporal spacings of the administrations of a recall test to pupils to whom certain expository materials had been presented orally. The seven experimental groups involved (one for each combination) were each composed of eight school classes. Since the classes were of approximately the same size, Spencer dealt with the unweighted class means as individual measures. The subjects were given an initial test of learning ability and a final criterion test after a lapse of sixty-three days, during which the various experimental procedures were administered. By standard procedures of analysis of covariance, Spencer analyzed these data so as to obtain (a) a "between groups" variance adjusted for differences between the groups in learning ability as revealed by the initial test, and (b) an appropriate error variance. Hence, by means of the F -ratio he was able to test the hypothesis that learning ability being constant, the experimental procedures are equally effective. The difficulties met in the ordinary matched groups experiment are considerable, but those which would be involved in an attempt to make up two groups of intact school classes would be almost insurmountable. The method of analysis of covariance permitted the equivalent of such an experiment with a minimum of administrative difficulties.

Conclusion: Need for More Complete Reporting

While examining the studies cited in this chapter, as well as many others not mentioned, the reviewers noted again and again the sketchy and inadequate manner in which the procedures used were described and the findings reported. In many instances it was utterly impossible to infer from the writer's description what statistical procedures had been employed, or, where the procedures could be identified, to check in any satisfactory way the accuracy of their application. The present review indicates a real need for more enlightened application in education of the newer statistical techniques, but, in the opinion of the reviewers, there is an even greater need for accurate, unambiguous, complete, and meaningful reporting. One need not present all the original data or reproduce all computations in a research report, but unless studies are at least so reported as to enable the reader to decide for himself whether or not an appropriate method of analysis was employed, or to check the crucial steps in the application of the method used (appropriate or inappropriate), the findings have no scientific value. In justice to the research workers it is only fair to say that the editors of the research journals may in part be responsible for this situation, through always urging brevity. They, at any rate, are in position to require the improvement that is so seriously needed.

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CHAPTER V

Evaluative Studies

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Scope of Chapter

EVALUATIVE STUDIES IN EDUCATION are numerous and varied. They range all the way from casual and informal appraisals that can hardly be dignified as studies or research (1, 26) to elaborate investigations requiring years of time by relatively large staffs richly endowed with foundation support (2). No attempt is made in this chapter to review all studies that come within this range. That would require an entire issue of the REVIEW rather than one chapter. The scope, therefore, is limited to a discussion of the over-all evaluations of entire educational programs or institutions. Studies involving an evaluation of schools by pupils and by outside or accrediting agencies have been extensively explored during the past decade. The chapter is limited, furthermore, to evaluative studies of secondary and higher education. Because practically all children who complete the elementary grades now go on to high school, the few follow-up investigations that have been made at this level are primarily concerned with achievement in secondary schools. Although this phase is important these restrictions prevent investigating acceptance of responsibility and community living. Clark and others (6) in 1940 summarized studies on the social effectiveness of education in such areas as financial and vocational success and school subjects.

From Measurement to Evaluation

Marked changes have taken place during the past few years in the nature of the studies designed to evaluate education (40, 41, 44, 60). The most apparent and, perhaps, the most significant is the broader scope of these investigations. Whereas previously the emphasis was upon measurement of single aspects of achievement, discrete behavior traits, or specific abilities, now more and more stress is placed on behavior patterns or appraisal of the educational program in terms of all the major objectives it seeks to attain (32).

Two major reasons can be cited for this change. In the first place, as measurement techniques improve or as they are available in wider variety, it becomes possible to measure larger and more complex aspects of behavior and to judge programs in terms of more comprehensive criteria. In the second place, the prevalent conception of education has changed from one predominantly concerned with the development of specific types of achievement as in spelling, knowledge of American history, or physics,

to one concerned with the development of total personalities—whatever that might mean scientifically. Psychologically, stress on interaction now supplements that placed upon reaction. This has led to broader programs of evaluation as described by Eurich (16, 17), Foster and Wilson (22), Lorge (33), Rath (47, 48, 49), Smith and Tyler (51), Troyer (55), Tyler (57), and Wrightstone (61, 62).

Purposes of Evaluation

Evaluative studies are undertaken for a variety of purposes. Some of the most important are:

1. *To check on the effectiveness of educational institutions in terms of behavior changes in or achievements of students*—Most evaluation in educational institutions has been concerned with testing or with other methods of appraising the knowledge and skill of individuals gained in courses (36). Educators have generally assumed that desirable behavior or action will follow knowledge and skill. In most courses the achievements of students, as measured by tests and examinations, are the immediate ones—those apparent after a short period of rather intensive training. In contrast, the tests developed by the Cooperative Test Service (9), and by the Eight-Year Study of the Progressive Education Association (51) are not limited in their use to specific courses. Although the effectiveness of a program can be measured in part by immediate results, the fact that much education is designed for future use indicates the need for an evaluation of student development over a longer period of time. After leaving school, individuals are subjected to many situations. Their abilities to make the necessary adaptations in after-school life and to achieve in relation to their capacities constitute acid tests for an educational program. Consequently, there is the need for follow-up studies which are broad in scope and not limited, as were many of the earlier appraisals, to financial and vocational success.

2. *To plan future educational programs and procedures*—This purpose follows the first. Most evaluative studies are being made to provide a basis for improving the program (25, 30, 37, 54). Again, to serve this purpose the studies must be sufficiently broad to affect not only the administrative policies of the institution but curriculum policies and the counseling of the individual student as well. In short, they need to cover the total program.

3. *To accredit institutions*—With the development of a broader conception of education, considerable dissatisfaction arose with accrediting procedures concerned primarily with the financial resources, the number of books in the library, and the training and experience of teachers. The evaluative studies that are setting the new patterns for accrediting procedures are likewise concerned with all the major objectives of the institution (7, 42). They follow, therefore, the same trend as other studies.

Methods Used in Evaluative Studies

Most of the methods used in evaluative studies are given full treatment elsewhere in this issue. By far the commonest method in follow-up studies is through the use of questionnaires. These have proved to be the most flexible and economical, though by no means the most reliable, method for securing evaluative information. Rating scales are at times incorporated in or supplement the questionnaires. Analysis of records gives information on the administration of the institution and on the development of individuals over a period of time. Tests are perhaps the commonest evaluative measure

applied to students in school and can be constructed to measure a wide variety of traits and behaviors. Direct observation furnishes data on some outcomes of education to an extent not possible by any of the above methods. Interviews provide another method of investigation as do reports by the subjects. These last three, properly used, can encompass more dimensions of thinking and acting than the first four, but the results do not lend themselves to statistical treatment.

The important point about methods in evaluative studies is that a wide variety must be used if a comprehensive evaluation is to be made. Each has its advantages and limitations, each complements and supplements the others, each is subject to misuse and misinterpretation. As new values in education are defined, as new needs arise, new techniques must be devised to appraise aspects of the educational program in order better to evaluate the whole.

Descriptions of Evaluative Studies at the College Level

Outstanding comparative studies of institutions include the extensive work of the North Central Association (42) and the Carnegie Foundation study of schools in Pennsylvania (31). The latter was based primarily on achievement examinations in the major subjectmatter divisions of college programs.

Prior to 1941 most follow-up appraisals of college programs were concerned only with the very limited objectives of economic and occupational success (14, 15, 19, 23, 29, 34, 38, 52). The most recent and extensive of a long line of studies of this character is the one by Babcock (3). Its unique contribution lies in the fact that the data were drawn from a scientific sample, based on the *Fortune* poll technique, of the status of all living United States college graduates. It provides the most complete and accurate data available on the economic and occupational status of college-trained men and women.

Follow-up studies concerned with a more complete range of college objectives have been relatively few, but undoubtedly their number will increase. The most extensive, in terms of the range of objectives covered, is that conducted by the General College of the University of Minnesota, reported by Pace (45). The General College was revising its curriculum to bring it more nearly in line with the characteristics of its students and the adults they were likely to become. A 52-page questionnaire was sent to a sample of former Minnesota students, both graduates and nongraduates, out of college from one to twelve years. The questionnaire covered activities, problems, attitudes, and interests in four areas of living—vocational, home and family, socio-civic, and personal. Attractively printed and profusely illustrated, the questionnaire drew returns from 70 percent of the former students who received it. In the questionnaire were standardized scales to measure job satisfaction, economic status, cultural status, liberal-conservative attitudes, general adjustment, and morale. All the items were

of the checklist type. Supplemental interviews were held with 172 of the 951 questionnaire respondents.

Extensive comparisons between the responses of graduates and non-graduates provided the basis for judgments concerning the effectiveness of college education. Further judgments about the strengths and weaknesses of the college program were based on the extent to which the typical pattern of activities, interests, and attitudes of the college-trained adults corresponded to the kinds of behavior which the college faculty believed should characterize college-trained adults. For example, the responses indicated that these adults held inconsistent attitudes toward related social problems; that many of them were interested in effecting home economies, yet they followed many uneconomical practices; that they were interested in broad national problems but not in local and community affairs. Results such as these were interpreted by the faculty as reflections—at least in part—on the inadequacy of the college program. The basic interpretative problem of follow-up studies of this kind lies in this question: To what extent are we justified in praising or blaming the college for the activities, interests, and attitudes of young people who, in this study, have been out of college from one to twelve years?

In the General College study some indirect evidence concerning the reliability and validity of responses was available. Approximately 7 pages of the questionnaire consisted of standardized scales of known reliability. These reliabilities centered in the .80's. Another 2 or 3 pages consisted of straightforward factual questions, such as: What is your job? How many children do you have? Approximately 10 pages were composed of questions regarding activities, such as: Did you plan expenditures on a budget? Did you make any articles of clothing during the past year? Did you vote? Did you have your teeth examined? One of the reasons for including so many simple questions of this "yes or no" type was the staff's belief that adults' answers to them would be straightforward and dependable. Not much evidence was available concerning the trustworthiness of responses to the 16 pages of items dealing with attitudes, opinions, enjoyments, and degrees of interest and participation. Some of the items, however, had been used previously in studies of General College students and their parents (10), and cross comparisons among the various groups suggested that the differences in responses were in line with what one would expect.

The questionnaire contained 7 or 8 pages of items designed to probe adults' need for more information. The responses to these questions were difficult to evaluate. Interviews with a sample of the questionnaire respondents indicated that among the men a majority had checked these items because they had actually experienced a need for the information, whereas among the women a majority had checked the items because they felt they ought to know more about them. The staff professed least confidence in the answers given to these questions. Many questions of this sort were employed by Fenlason and Sletto (20, 21) in a questionnaire follow-up

study of social case workers in Minnesota. In a section on social case work techniques, a checklist of thirty-seven techniques was preceded by the question: "Do you feel an urgent need for additional knowledge of this technique in the satisfactory performance of your work?" The focus of the inquiry upon a job analysis and the phrasing of the question in terms of an urgent need provide a more appropriate setting for this type of item than occurred in the General College study.

Other colleges have attempted to appraise the effectiveness of their educational programs by sending questionnaires to alumni which solicit directly their opinions concerning the values of their college experiences. The follow-up questionnaire sent to former Bennington College students (18) and the Stanford follow-up inquiry by Isle (27) are examples. One item included a list of fifty features such as: "1. individual conferences with counselors; 2. social life at the college; 3. system of trial majors; 4. housing facilities." The alumni rated each of these features as "very satisfactory," "fairly satisfactory," "neutral," "rather unsatisfactory," or "very unsatisfactory." Free response or essay questions were also used. For example, "List in order of importance the experiences, courses, or instructors that, in your judgment, made the greatest contribution to your development while at Bennington." "What defects were there in your college work as you see it now?" The Stanford follow-up questionnaire was designed for alumni who were engaged in teaching or in other educational work. Rating scales, checklists, and free response items were also included.

The chief interpretative problem in this type of questionnaire lies in the extent to which alumni can introspect reliably about the values of their college experiences. It is likely that old graduates develop a halo about the values of their education which tends to make their judgments unreliable. The purpose of the investigation may likewise influence results. Criticisms on both these points can be made of the work of Tunis (56) and Rogers (49). Both of these studies included old graduates, and both studies were made to celebrate college anniversaries: the former to commemorate the 25th reunion of a Harvard class, and the latter to celebrate the 75th anniversary of Vassar College. Greater faith in the results is justified when the subjects are recent graduates and when the purpose of the investigation is frankly to evaluate and improve the college educational program. Recent graduates experiencing the demand of new tasks may have valuable insights to contribute to the college faculty regarding the strengths and shortcomings of the instructional program. Isle (27) reported that Stanford graduates were much more critical of the Stanford program than were their employers.

The follow-up study, as a means of appraising the effectiveness of education, is used most appropriately as but one phase of a larger pattern of evaluation of a college program. The complete evaluative studies of Bennington College, the General College of the University of Minnesota (12), and Stanford University's School of Education (35) used standardized achievement tests, numerous questionnaires, checklists, interviews, and rat-

ing scales with students and faculty in college as well as a follow-up of graduates.

Evaluative Studies at the Secondary-School Level

Four major evaluations using follow-up studies as part of the total pattern of appraisal may be cited—the American Youth Commission, the Cooperative Study of Secondary School Standards, the New York Regents' Inquiry, and the Progressive Education Association Eight-Year Study.

Stimulated by the youth problem of the depression years, Bell's study (4) for the American Youth Commission was a pioneer attempt to determine and analyze the status of a representative sample of Maryland youth, ages sixteen to twenty-four. Interviews were held with more than 13,000 young people, sampled on the basis of sex, race, school status, job status, social and economic status, marital status, type of community, and other relevant factors. The study was concerned with youth at school, home, at work, play, and church. In appraising their schooling, three-fourths of the total group said they had received no vocational guidance (yet economic security was their most pressing problem), 27 percent attributed little or no economic value to their schooling, and 12 percent attributed little or no cultural value to it. The amount of schooling youth received and their appraisal of its value were clearly related to the economic and occupational status of their parents.

The follow-up phase of the Eight-Year Study has been reported by Chamberlin and others (5). Graduates from thirty experimental high schools were matched with graduates of traditional high schools on factors of scholastic aptitude, sex, race, age, religious affiliation, size and type of high school, size and type and location of community, socio-economic status of family, and extracurriculum activities in high school. The subsequent success in college of both groups was compared. College records and reports, special questionnaires and tests, and personal interviews were used to gather evidence with respect to nine aspects of college success: intellectual competence, cultural development, practical competence, philosophy of life, character traits, emotional balances, social fitness, sensitivity to social problems, and physical fitness. In many of these areas or aspects of competence the mass of data for each student was summarized by means of judges' estimates of its correspondence to briefly described behavior levels or types. For example, to get a judgment on the extent of students' interest in current affairs each case was rated to fit one of the following five categories (5, p. 13):

1. Matters of social, economic, political, and humanitarian significance command his interest and objective study. Does something about it. Membership, writing, contributing, agitating.

2. Considerable reading and discussion of these matters. Many matters of social, economic, political, and humanitarian significance command his interest. May or may not do anything about it.

3. Somewhat limited or inconstant interest in many phases of these matters. Usually aware of them.

4. Limited to certain phases, or sporadic only. Little attempt to keep up with what is going on.
5. Not interested at all.

This rating technique has been used previously and comprehensively by Darley and Williams (11) in analyzing the case records of one hundred students of Minnesota's General College and their parents. Williamson and Bordin (58, 59) used a similar method of rating materials from case records in evaluating the success of student counseling.

Other features of the graduate follow-up in the Eight-Year Study are noteworthy. The staff selected graduates from the six schools whose programs were judged to have departed most significantly from traditional practices, and then from the two most experimental schools, and compared them with matched students from traditional schools. In these comparisons differences between experimental and control groups were successively greater than the ones revealed between the total experimental and control groups. Simple and common sense methods of analysis such as these are highly appropriate for evaluative data which, at the present level of development, are not precise in any mathematical sense. Final value judgments of the success, goodness, or effectiveness of educative experiences are and should be based on the main trends and major patterns of results from a variety of data.

Follow-up appraisals in the Regents' Inquiry are reported by Eckert and Marshall (13). A battery of tests of information, skills, aptitudes, and attitudes was given to pupils about to leave high school. Further data were obtained from questionnaires and from school principals after the pupils' withdrawal. Analysis of the traits and attitudes, patterns of interest, plans for the future, and present school and work activities thus obtained provides evidences of the social competence of leaving pupils, and by implication, of the success of the schools' programs. Subsequent interviews with the pupils, principals, and a third party, held several months after withdrawals, gave further data for judgment on the vocational, social, and leisure-time adjustment of former pupils.

In the Cooperative Study of Secondary School Standards (7) a seven-point program of appraisal was employed in judging two hundred secondary schools: use of the *Evaluative Criteria* (8), judgments of field committees, progress of pupils as measured by standard tests, college success of pupils, noncollege success of pupils, judgments of pupils, judgments of parents. College success was measured solely in terms of academic success. Noncollege success was judged from responses of former pupils to a questionnaire which called for ratings on reasons for leaving school, helpfulness of school in vocational placement and progress, contribution of school in developing various appreciations and interests, and general comments on the satisfactoriness of high-school experience. Judgments of pupils in school were likewise obtained from questionnaires combining rating scale and essay type items. Parents' judgments were solicited by questionnaire rating scales with respect to their degree of satisfaction with twelve aspects

or goals of the school's program—such as good citizenship, social life, educational guidance, and reading habits.

Several other evaluations of schools by students, parents, and laymen have been made (24, 28, 39, 43, 46, 50).

Contributions in Method: Approaches to Evaluation

The studies reviewed here are the most comprehensive. Many other studies could have been cited that used one or more of the wide variety of methods employed in the more comprehensive investigations. The contributions to methods made through these extensive investigations have been general rather than detailed. No new techniques were developed in any of these major investigations, but new ways of adapting and applying them were developed. The methods had all been used and tried in previous but more limited studies. For example, the institutional pattern map as used in the North Central Association studies had been used previously in a less extensive study of New York colleges. In essence the map was an adaptation to institutions of the profile charts for individuals, and the data for each variable on the map were gathered through common techniques, such as tests, questionnaires, records, reports, and interviews. Some major contributions, however, were made in adapting old methods to the comprehensive problems investigated and in setting a pattern for broad approaches to evaluation. These contributions are:

1. *In refinement of methods*—For example, the 52-page questionnaire used in the Minnesota study represents a high point in the use of this technique. Great care was taken in formulating each item in order to eliminate ambiguities. The questionnaire was tried out in preliminary form before it was printed with attractive layouts and many illustrations. In these ways a method that had been used extensively was refined for this particular study. Similarly, in other investigations the older methods were extended and refined in application.

2. *In the use of a wider variety of methods*—In the more comprehensive evaluations, a wider variety of methods has been used than was common in the earlier studies. In the Eight-Year Study, for example, interviews, questionnaires, rating scales, records, tests and examinations, and analysis of curriculums were all used. The best of the methods developed in previous investigations were applied in a single study in an effort to arrive at a more comprehensive evaluation.

3. *In analyses of major educational objectives as the basis for final evaluation*—In practically all the major investigations reviewed in this chapter, emphasis was placed upon the analysis of objectives as a basis for determining what data should be collected. In the Bennington study, college records, founders of the college, students, faculty, and trustees all contributed to an analysis of the objectives of the colleges. After these objectives were defined through extensive deliberations they provided the basis for collecting information through questionnaires, tests, rating scales,

records, and interviews. Briefly, this procedure, upon which the major studies agree, means that a sound evaluation of an educational program can be made only in terms of the major objectives that program is set up to attain.

4. *In following up individuals over a relatively long period of time*—The evaluative studies of recent years have sought to correct a deficiency in previous studies by following up individuals over a relatively long period of time. The Pennsylvania study (31) established a new pattern in this regard. Likewise the Eight-Year Study by its title designates a follow-up period. The spot evaluations of the earlier studies made over a brief interval were clearly inadequate because they did not reveal the contributions of the educational program to after-school life. As long as such was the case, institutions could make all kinds of unfounded claims for their programs. If follow-up studies of this type continue to be made the time may come when such claims are regarded as no more significant than the tales of the miraculous healing qualities of herbs peddled by the old medicine man.

More long-period follow-up studies must be made before more adequate appraisals of education will be available. This will mean fewer but more significant evaluative studies.

Contributions in Terms of Results

1. *The contributions of education are clearly disappointing if viewed from the standpoint of the claims made for it.* The Pennsylvania study (31) discovered unbelievably low accomplishments in many students who had the advantages of a college education. In the New York Regents' Inquiry, Spaulding (53) found that:

Among the boys and girls leaving school each year are a considerable number whom the schools themselves are unwilling to recommend for responsible citizenship. (p. 17)

Irrespective of the schools' judgment of their readiness for citizenship, the leaving pupils as a group are seriously deficient in their knowledge of the problems, the issues, and the presentday facts with which American citizens should be concerned. (p. 18-19)

The boys and girls who are on the point of leaving school, whatever they may think about the desirability of certain kinds of action, are reluctant to assume responsibility for civic cooperation, or to commit themselves to action which will involve personal effort or sacrifice. (p. 24)

Once he is out of school, the ordinary boy or girl does practically nothing to add to his readiness for citizenship, nor does he even keep alive the knowledge of civic affairs or the interest in social problems which he may have had when he finished his schooling. (p. 27)

In the Minnesota study, Pace (45) found that:

The graduates were distinguished from the nongraduates chiefly by the fact that they were more likely to have professional jobs, a little—but not much—more income, and somewhat greater satisfaction with their jobs. In other areas of living there were few differences, or none at all, between graduates and nongraduates. (p. 51)

Briefly then, the results of these follow-up studies show that education has not been as effective as claimed by those responsible for carrying it on.

2. *Broader evaluations have been made possible*—This might be expected from the application of a wide variety of evaluative methods growing out of an analysis of objectives. These broader evaluations have, in turn, made possible better solutions to practical problems such as those involved in accrediting. The pattern map of the North Central Association and the *Evaluative Criteria* of the Cooperative Secondary School Study are examples.

3. *An array of judgments of relatively mature individuals on the effectiveness of the educational process has been provided*—For the most part these judgments give a more encouraging picture of the contribution that schools and colleges have made to the lives of individuals than do test results or analyses of the civic or social life of former students.

4. *Perhaps the major contribution is that derived by the institutions which conduct them*—If the study is made with all groups participating, as was the case in the Bennington study, in which students, faculty, and trustees all took part in a cooperative undertaking, the effect upon the institution is a major one. Thus, evaluative studies can and do form an important step in the development of the program at a given institution.

Major Criticisms of Evaluative Studies

Major criticisms of evaluative studies which need to be guarded against in future investigations are:

1. *The instruments used are not adequately appraised.* The questionnaires, for example, are in many cases elaborate but their validity and the reliability of results are too infrequently established. The refinement of instruments may be only an elaboration and may not actually contribute to the accuracy and dependability of results.

2. *The direct contribution of the schools and colleges is not isolated from contributions of other experiences.* Because the individual is the product of all his experiences and his native endowment, it is practically impossible to isolate the contributions of the educational program to his development from the contributions of other experiences. In follow-up studies it is desirable that the investigation be extended over as long a period as possible. The longer the period, however, the more difficult it becomes to determine the effects of the educational program because many other experiences intervene. From the standpoint of the individual it is probably not important to isolate the contributions of school or college experiences. From the standpoint of evaluating the educational program it becomes very important to do so. The "control technique" as used in the Eight-Year Study is the only method used in the follow-up investigations for isolating, at least in part, the contributions of one form of education over another.

3. *Elaborateness of studies is discouraging to many school systems and institutions that desire to make an over-all evaluation of their programs.* No simple and inexpensive technique has as yet been devised nor is one likely to be devised that will provide an evaluation of an entire educational program. For this reason many schools and colleges feel they cannot make an evaluation of their program. Every institution, however, has an evaluation process going on at all times whether or not it is recognized as such. The comprehensive investigations which have been undertaken primarily as research projects provide many valuable suggestions. Although simpler methods may need to be devised for ordinary use this criticism need not be taken too seriously at this time. It is mentioned here primarily because many institutions have used it as a rationalization for not making a more concerted effort to evaluate their programs.

4. *Evaluative studies do not reveal contributions to the development of the individual.* Practically all the evaluative studies summarize data for groups. Case studies have been made but are difficult to interpret. In extending research studies there is considerable need for making more extensive case studies over a long period of time.

In spite of these criticisms, considerable progress has been made during the past decade in extending the scope of evaluation studies. More and more school systems, colleges, and universities are planning over-all evaluation programs in terms of their major objectives. The question usually arises as to who should carry on the process. Clearly if the purpose of evaluation is to provide a basis for improving the educational program, those responsible for this program should take an active part in the evaluation. To be sure, competent technical direction is needed. When provision is made for such direction the institution, through a co-operative undertaking, may make further contributions to the methods for carrying on evaluative studies as well as to the effectiveness of its own educational program.

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CHAPTER VI

Questionnaires, Interviews, Personality Schedules

FRANK W. HUBBARD

The Questionnaire

In Chapter IX of the December 1939 issue of the *REVIEW* the major criticisms of the questionnaire technique were pointed out. Recent professional literature reveals, however, that in spite of the advice given in this and other research publications, the common mistakes continue to appear with some frequency. There has been some tendency to restrict the use of the term "questionnaire" to forms that require statistical and objective replies; the terms "opinionnaire" and "expressionnaire" have been used by workers at the Character Education Institute of Washington University (15) on forms calling for subjective and qualitative answers.

Relatively few research studies have appeared since 1939 dealing directly and experimentally with the questionnaire as a method of investigation. A number of recent books and articles have, however, treated the methods, errors, and limitations of the questionnaire technique. Particularly useful are the chapters by Koos (14), Lindquist (19), Lundberg (20), Toops (41), Wert (42), and Young (44). Magazine articles with helpful suggestions have been prepared by Jenkins (11, 12) and Phillips (27).

Preparing the Questionnaire

Wording—The use of the questionnaire technique in surveys of opinions has led to greater attention to the wording of questions. Cantril (7) and Rugg (32), from experience with the Princeton Public Opinion Research Projects, reported that the use of the names of prominent men (such as Roosevelt or Hitler) definitely influenced the responses to specific political questions. Blankenship (3) pointed out the existence of "danger words" characterized by emotional appeal, ambiguity, and too high vocabulary level. Jenkins (11) suggested that there are four major ways in which questions may reduce the dependability of the answers: (a) by predetermining the answer thru the use of leading or "loaded" questions or thru the improper order of the questions; (b) by the use of ambiguous terms and vague questions; (c) by exceeding the ability of the respondent to use unfamiliar words or to deal with complex questions; and (d) by inviting inaccurate responses. Ghiselli (9) found that respondents were more willing to reply and that their replies were generally more satisfactory when they were allowed to qualify their opinions than when they were forced merely to agree or disagree with a fixed statement.

Pretesting—Both Blankenship (4) and Sletto (35) reported that pretesting the questionnaire with small groups insures greater reliability in the answers and increases the probability of a satisfactory return.

Questionnaire Administration: Sampling; Follow-Up

Sampling—Lindquist (18) called attention to the fallacy of using merely a large number of individual replies from a few schools when in reality the school is the unit. He recommends "stratified sampling" or the selection of cases from each identifiable subgroup within the total population under investigation. Both Reid (28) and Stanton (36) showed that those responding to mail surveys are not necessarily representative of the nonrespondents. In both studies having to do with the ownership of radio equipment it was shown that the "haves" are more likely to reply than the "have nots." Follow-up procedures are recommended to increase the proportion of the returns and thereby to reduce the possibilities of bias. Suchman and McCandless (37) found thru further mailed questionnaires and telephone interviews that the interest of the recipient in the topic under consideration and the amount of his education affected the return. Pace (26), in attempting to determine the probable direction of the bias in a study of college alumni, reported that graduation from the university and the number of quarters of university work completed were important factors in influencing the returns.

In studying the flying habits of the patrons of airlines Rollins (30) found that a follow-up questionnaire gave a truer picture than a single inquiry and that double inquiries to a small list yielded greater returns than a single inquiry to a larger list. Shuttleworth's investigation (34) of the employment status of majors in technology confirmed the possibility of large sampling errors from incomplete returns. Returns from the original inquiry showed only 0.5 percent unemployed; replies from duplicate questionnaires used as a follow-up raised the percent of unemployment to 6.6; then a final drive, resulting in almost complete coverage of the group, brought the percent of unemployment down to 4.0 percent.

Increasing the returns—Moore (23) varied his procedures in submitting a questionnaire to superintendents of schools. He found that typewritten letters of transmittal brought 16 percent more responses than did duplicated letters. Follow-up letters produced a further 16 percent increase in the number of replies.

Reliability of Questionnaire Returns

Lewis (17) investigated the consistency of the replies of 216 teachers when asked to respond on two different occasions to the same questionnaire. He reported that in the second reply more than half of the teachers varied their responses on more than half of the items. In the most consistent report discrepancies were found with respect to only 16 percent of the items; in other cases, the responses varied on as high as 96 percent

of the items. Lentz (15), using a social science "opinionnaire," found changes on specific questions occurring with amazing frequency. Such variation would be expected, however, in responses to questions dealing with opinions. He concluded that the summation of reactions on a number of items was reliable. Neprash (24) studied the statistical reliability of questionnaire returns, reporting a 20 percent unreliability of responses to specific questions on social attitudes and opinions. These studies indicate the importance of proper questionnaire procedure and the limitations of certain types of replies.

Special Uses of Questionnaires

Byler (6) reported the use of inquiry forms in ascertaining the interests and needs of students prior to a program of curriculum revision. Lewis (16) found the questionnaire procedure effective in calling the attention of pupils to certain problems of pupil conduct, study hall conditions, etc. When followed by discussion in homerooms the results were apparently more satisfactory than the "preaching" plan so often followed in high schools. Gilkinson and Knowler (10) described a multiple-choice guidance questionnaire for students of speech. Cureton (8) recommended the questionnaire (and other procedures such as the interview) in promoting group thinking. Outland and Jones (25) described the application of the questionnaire to curriculum appraisal. They warned of the limitations of the procedure, however, since pupils usually are interested in immediate problems more than in remote matters even tho the latter are vital.

The Interview

Few research studies have appeared recently with respect to the interview. Symonds (38), in an article on research in this field, cited only four studies during the entire period from 1926 to 1934. Based chiefly on experience rather than on the results of controlled studies, a number of general discussions of the interview technique are available. Among these are articles by Aldrich (1), Johnson (13), Symonds (39), and Wilkins and Kennedy (43). One usually finds in these discussions considerable emphasis on the importance of "rapport" with the person interviewed; the necessity of privacy; the wisdom of making systematic records after the conference; and the advisability of verifying data and using caution in making interpretations. The inquiry forms devised for a personnel research study in the General College of the University of Minnesota (22) have been termed "a contribution to the tools of social inquiry."

Schellhammer (33) suggested three ways of compensating for variability due to personal elements in an interview: (a) arrange several interviews per interviewee, each conducted by a different consultant; (b) have each interview conducted by a series of experts, each concerned with the phase related to his own field of specialization; or (c) have several consultants

sit as a committee to conduct each interview. He also recommended that each interview be focused on a single, clearly defined purpose.

Recording the Interview

Symonds (40) attempted to discover experimentally the amount and types of material forgotten in various periods between the interview and its recording. He concluded that records made immediately after the interview contained the maximum of details. Most significant parts of the interview, however, were usually not forgotten even tho not immediately recorded. The lapse of a reasonable interval of time resulted in dropping relatively unimportant details and may have favored integration of significant facts.

Vocabulary of the Interview

Many of the studies that apply to the formulation of questions in questionnaires apply equally to the interview procedure. Roslow and others (31) reported on the basis of field studies of the Psychological Corporation that the use of stereotypes or emotionally charged words may produce marked changes in responses; also, that the responses to alternatives in checklist questions are influenced by the number and the completeness of the alternatives. Young (45) called attention to the differences in meanings for different persons of such common terms as "housing," "unemployment," and "cost-of-living." Her recommendations as to careful organization of the blank, recognition of the background of respondents, use of simple words, and avoidance of emotionally charged words are similar to the proposals usually made with respect to questionnaires.

Special Uses of the Interview

As is true of the questionnaire, the interview is being used more widely in administration and instruction. For example, Anderson (2) suggested that pupils be encouraged to prepare "imaginary interviews" with the characters of history since the method requires familiarity with facts about each character studied. Robinson (29) suggested the interview as a way to discover administrative problems and to receive suggestions from teachers with respect to their solution. Merrill (21) advocated the use of the interview in obtaining material for high-school papers and in other news-gathering activities. Brophy (5) found the interview a valuable supplement to test results and questionnaire reports in counseling university students.

Personality Schedules¹

Personality and character tests were treated in Chapters V and VI of the February 1941 issue of the REVIEW. Only a brief note, therefore, will be added here.

¹ This section was prepared by Ruth Strang.

The California Test of Personality (49) covers somewhat the same areas as the well-known *Bell Adjustment Inventory*, but including a lower age level. The profile constructed on the basis of the responses is divided into two sections: self-adjustment and social adjustment. Somewhat different in form and most carefully developed is the *Detroit Adjustment Inventory* (46) designed for junior and senior high-school students. It consists of 120 items dealing with 24 "problem situations." For each item there are five statements in the first person of which the subject indicates the one that describes him best. This inventory has been in use for more than three years in the Detroit Psychological Clinic and significant differences were found between scores of sixty-one behavior and twenty-seven non-behavior cases. The *Minnesota Multiphasic Personality Schedule* (53) is superior to the personality schedules whose scoring keys were constructed on a statistical rather than on an experimental basis; it has been standardized on 1,500 normal individuals and on 220 psychopathic patients. The unique features of *My Personality Growth Book* developed by McCall and Herring (54) are emphasis on improvement in personality and use primarily as a teaching instrument. Five new experimental scales were developed by Darley and McNamara (50) on the basis of factor analysis applied to test and retest performance on thirteen existing attitude and adjustment scales. The numerical high point in factor analysis was reached by Brogden (48) who made a factor analysis of the character traits involved in the scores of forty tests purporting to measure various phases of character, intelligence, and personality. No one has yet demonstrated, however, the correspondence between the traits which come out of the factor analysis and the personality patterns of individuals.

Critical Appraisal of Personality Measures

The approach to the study of personality through tests of evaluative attitudes has proved its worth, according to the comprehensive review of this type of test made by Duffy (52). When certain other types of self-estimate questionnaires have been subjected to realistic validation, as by Bonney (47), Dudycha (51), Ryans (55), and Wile (56), individual errors of judgment have been found to be extensive. The findings of Bonney (47) are welcome, if not reassuring. The reports of fifth- and sixth-grade pupils on their absences, library book withdrawals, Sunday-school attendance, and weekly spelling scores for one semester, when compared with the actual records, showed an average complete accuracy of only 27 percent and an approximate accuracy of 43 percent. Accuracy of estimate seemed not to be related to chronological age or I.Q.

Additional evidence of the inaccuracy of self-appraisal in individual cases was presented by Ryans (55) on the bases of his analysis of test scores and self-ratings on a five-point scale of items on (a) correct English usage, (b) effectiveness of English expression, (c) speed of reading comprehension, (d) understanding of difficult reading materials, (e) extent of vocabulary, (f) general cultural knowledge, and (g) knowledge of

current happenings. Self-appraisals, in the form of group averages, were reasonably accurate but individual errors of judgment were extensive in many cases. Wile (56) obtained experimental evidence of the lack of validity of personality tests by comparing the diagnostic statements derived from several methods of personality study with the case records of one hundred clinic children and with items determined by the chance selection of playing cards. The percentage of correct statements derived from the chance test was as high or higher than the results obtained through several methods alleged to have true diagnostic value.

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CHAPTER VII

Test Development: Statistical Aspects¹

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FOR THE PERIOD REVIEWED the large number of publications, either directly or indirectly related to the statistical aspects of test development, made it imperative that severe restrictions be imposed on the scope of the following discussion. Correlation, analysis of variance, and other techniques were not reviewed unless they happened to relate to tests. It may be observed that although the greatest frequency of publications was found under factor analysis, the studies apparently showing the keenest insight in terms of analysis of basic concepts appeared under reliability.

Bibliographies and General Discussions

In a restricted manner this review continues the previous one by Flanagan (24). Cook (9) and Potthoff (52) gave general discussions of achievement testing. Horst (38) considered the logical bases underlying all testing and especially personal adjustment. Dunlap (20) presented a classified bibliography of statistical developments over a three-year period, and concluded with a summary of certain statistical errors made by psychologists. Swineford and Holzinger (59) continued their annual summaries of statistical developments. Weidemann (62) reviewed the conflicting evidence concerning the inconsistency of measurement indicated by essay as compared with objective studies. Jackson and Ferguson (41) discussed studies of the concept of reliability. Though not restricted to test statistics, the *Journal of the Royal Statistical Society* has published a rather comprehensive annual bibliography of statistics since 1936, largely under the direction of J. O. Irwin.

Factor Analysis

The popularity of factor analysis methods is attested by the fact that the greatest frequency of studies was found in this area. A number of

¹ Statistical methods are treated also in Chapters IV and VIII of the present issue; chapters devoted to statistical methods have previously appeared in the REVIEW OF EDUCATIONAL RESEARCH as follows: ¶ John C. Flanagan, "Statistical Methods Related to Test Construction and Evaluation," 9: 109-30, February 1941. ¶ Karl J. Holzinger, "Factor Analysis," 9: 528-31, 619-21; December 1939. ¶ Douglas E. Scates, "Index Numbers and Related Composites," 9: 532-42, 622-25; December 1939. ¶ Palmer O. Johnson, "Statistical Methods," 9: 543-54, 626-29, December 1939. ¶ Max D. Engelhart, "Classroom Experimentation," 9: 555-63, 629-30, December 1939. ¶ Edward E. Cureton and Jack W. Dunlap, "Developments in Statistical Methods Related to Test Construction," 8: 307-17, 357-62, June 1938. ¶ Herbert A. Toops, and G. Frederic Kuder, "Test Construction and Statistical Interpretation," 5: 229-41, 309-14; June 1935. G. M. Ruch, "Recent Developments in Statistical Procedures," 3: 33-40, 65-72, February 1933. ¶ Additional brief treatments occurred in the following chapters, December 1938, Chapters V (Frutchey) and VII (Scates); December 1935, Chapter III (Landquist), February 1933, Chapter II (Osburn); and October 1932, Chapter IV (Baker).—Editor.

trends seemed to be discernible. There was an increased emphasis upon the logical implications of factors and an attempt to reach some kind of synthesis among the various methods. Increased ease of computation was being sought with some success, and more nearly adequate tests of significance seemed to be in the process of incubation. As usual, the empirical application of the method formed the modal type of study. No new methods of factor analysis were found in the educational field.

Among the attempts to synthesize the various factor systems and to indicate where each might be used appropriately were the publications of Burt (2), Holzinger and Harman (35), and Swineford (58). Holzinger and Harman (35) considered the various types of factor analysis and pointed out the desirability of separating the statistical aspects from the theories in a particular field. They gave a discussion of statistical criteria leading to a choice of form and method, and prepared a compilation of the leading factor systems. Swineford (58) compared multifactor and bifactor analysis. Burt (2) emphasized the essential similarity of all factor theories and all methods of factor analysis, a contention he supported with data on temperament types. Burt urged that factor analysis be regarded as a logical rather than a mathematical method. Logically, he insisted, factors were principles of classification which specified a system of relations. A factor was valuable because it enabled us to hold in mind a definite but complex pattern of characteristics. For this point an excellent illustration was provided by two studies of verbal ability. Carroll (3) confirmed Thurstone's M, but V was split into three factors, and W was split into two. Johnson and Reynolds (43), however, found two factors which appeared to be closely related, if not identical with, Thurstone's W and V factors.

Other developments were Horst's (37) method for transforming an arbitrary factor matrix into simple structure by a method which is almost entirely objective; Coombs's (10) and McNemar's (47) discussions of criteria for determining the number of factors to be extracted; and Ferguson's (21) indication that differences in difficulty between two tests or two test items were represented in the factorial configuration as additional factors suggesting that if all tests included in a battery were roughly homogeneous with reference to difficulty, existing hierarchies would be more meaningful. Guilford (30) brought out the same point when he indicated that the same kind of item might measure different abilities according as it was easy or difficult for the individual. General discussions of factor analysis were given by McCloy (45) and Holzinger (36).

Two discussions of tests of significance were worthy of mention. McNemar (46) reported that three empirical studies on factor loadings agreed in showing that sampling behavior of the first centroid factor loading was much like that of correlation coefficients, whereas sampling fluctuations for loadings beyond the first were distressingly large. Young (64) applied the method of maximum likelihood to the problem of estimation in factor analysis. In a special case he observed how test fallibility en-

tered into factor determination, and that the method of communalities underestimated the number of factors. It is hoped that Young will continue his studies to include the more general case.

Reliability

Especially noteworthy among studies of reliability was the increasing substitution of an analytic rational, rather than a crude empirical, attack on the basic problems and concepts. Outstanding in this respect were the studies of Hoyt (39), Jackson and Ferguson (41), and Kelley (44).

Kelley (44) defended the traditional odd-even reliability coefficient and indicated that it was a quantitative statement of an act of judgment that the things correlated were similar measures. It was because the Kuder-Richardson formulas ignored this act of judgment that they were inadequate. Kelley argued, further, that it was less severe to split halves than to draw up items in the first instance which measured the same function.

Though he questioned the Kuder-Richardson formulation of reliability, Kelley considered the idea important in connection with a definition of the "coefficient of coherence"—a measure of the singleness of purpose of the items constituting the test. Kuder and Richardson assumed complete unity of purpose when they assumed a rank of one for their correlation matrix of test items, but Kelley thought it better to measure actual proximity to a rank of one by computing the "coefficient of coherence."

In a penetrating analysis of reliability, Jackson and Ferguson (41) showed that reliability may be interpreted with emphasis on errors of measurement, on stability of scores, or on sensitivity for assessing individual differences. They would abandon the blanket term reliability in favor of more specific estimates of absolute and relative accuracy of measurement. Estimates of reliability, they suggested, could best be obtained by the analysis of variance since it separated the influence of errors, practice, individual differences, and facilitated the computation of Jackson's measure of sensitivity.

Several experimental studies were cited to show that retest, comparable form, and split-half reliability were not the same. The Kuder-Richardson measure, they indicated, was based upon internal consistency whereas the usual definition implied agreement between two sets of measurements. To find the most reliable combination of a group of tests a method of combinatorial analysis was described. Those who work with tests will find the "Suggested Test Report" (41:104) of considerable value.

Similarities and contrasts between the Kelley and the Jackson-Ferguson discussions may be observed. Both criticized the Kuder-Richardson formulation of reliability. Kelley would retain the traditional split-half form whereas Jackson and Ferguson would substitute measures of absolute and relative accuracy of measurement. Both indicated that the assumption of a rank of one for the correlation matrix was untenable. Kelley would

evaluate the rank by his "coefficient of coherence," while Jackson and Ferguson showed that the assumption was sufficient but unnecessary.

The present reviewer agrees with Jackson and Ferguson that there is considerable merit in using the analysis of variance for obtaining more specific descriptions, but also recalls that it was Jackson (40) himself who warned against the adaptation of methods from agriculture to the field of education without making modifications to fit the new conditions in education. Some of his arguments appear, by analogy, equally cogent in the case of linear hypotheses. More explicitly the linear hypothesis does not take into account the important aspect of measurement described as validity, except to describe a lack of it as a biased error or error effect (p. 19). This assumption seems somewhat indefensible since the error effect is described in terms of the measures themselves. We can specify a particular confidence range at any level of significance and yet not have validity. Validity is more than a biased error. Bias and accuracy of measurement logically show some degree of interaction. Knowing the amount of bias will be of no use unless the extent of interaction of the bias with the error of measurement is also known. It is this lack of consideration of the aspect of validity that leads one to question that the Jackson-Ferguson formulation is the final answer.

Hoyt's (39) use of analysis of variance to compute reliability is also of interest. In Hoyt's method the numerator of his ratio for the determination of the reliability was "among individuals" minus "remainder" mean square. Dividing this by "among individuals" mean square he got reliability, or dividing it by "remainder" mean square he got Jackson's gamma squared. Apparently the difference between reliability (internal consistency) and gamma squared was the difference between two yardsticks—one calibrated in inches, the other in quarter inches.

Other studies which should be cited are: Casanova (5) presented formulas to show the effect, upon the reliability coefficient, of changes in the variables involved in its estimation. Clarke (7) indicated that predictable accuracy in examinations was set by the inconsistencies of performance of the same individual and proposed to quantify the function by his coefficient of "ubiquity." Dressel (18) gave another derivation of the Kuder-Richardson for ρ_a , and Mosier (51) used it to derive a formula to simplify its computation.

Remmers (53), in a series of empirical studies, achieved inconclusive results while Ferguson's (22) discussion may be said to represent a rationalization of the problem. Some other empirical studies were reported by Carter (4), Cronbach (12), Drake (17), Froehlich (26), and Guilford (29).

Validity

The fact that test makers and researchers were becoming increasingly aware of the problems of meaning and interpretation of results may serve to add increasing meaning to their results in the future. Weighting

and item analysis may be considered as phases of validity since all eventually aim for maximum agreement with the criterion.

Richardson (55) gave a comprehensive discussion of the weighting problem and indicated that the choice of a method of combining variables depended upon the properties which one wished the composite to have. Naturally there could be no single best method to be used in all circumstances. He indicated the properties of several of the commonly used methods of weighting. In this connection mention should be made of Rulon's suggestion (56) for using test scores regressed in terms of their reliability instead of actual scores. Such regression reduces the variability of the test scores and gives a result which is more sensible than raw scores, so long as one works with a single test. If, however, a composite is to be made of several tests one should not weight these regressed scores inversely as their standard deviation (to get *z*-scores), for to do so would be to assign the greatest weight to the least reliable score.

Within this area, as in others, illustrations abound to show that lack of mathematical training among psychologists reflects itself in terms of partial solutions to problems where relatively complete solutions are possible. An example is the study by Forlano and Pintner (25) who used an empirical method to determine the percentage of the total groups which must be taken at the extremes of a distribution in order to get maximum differentiation. They found that even for moderately skewed distributions 27 percent seemed satisfactory. An analytical solution of the problem would have specified the exact percents for the various levels of skewness.

Some methods of item analysis which considered only the relation of the item to the criterion were proposed by Daniel (14), Garlough (27), and Guilford (29). Toops (61) gave further discussion of his *L*-method which considers the relation of the items to one another, while Guttman (32) presented an interesting theoretical discussion of the problem.

Psychophysical methods were applied to item selection by Ferguson (23) and Mosier (50) and to scaling by Grossnickle (28).

Thomson (60) followed individual items of an intelligence test over a period of successive retesting, and found that it was not so much the type of item as its difficulty which was of predictive significance.

Scoring

Hartog (34) argued that he had empirically demonstrated a superior educational value and reliability of grading for English compositions written with a given audience in mind than under the usual procedure. Weidemann (62) continued his studies of the essay examination.

Deemer (15) suggested criteria for estimating tolerance limits of scoring errors per paper, when these errors obeyed the Poisson law. Shen (57) contended that the more cautious subjects were unfairly penalized for their omissions on matching tests and proposed a formula to correct the effects of guessing. Colandra (8) in a theoretical discussion used Baye's theorem as the basis of a general equation for scoring objective tests.

The limitations of Baye's theorem and the increased scoring difficulty make the application of little practical importance.

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CHAPTER VIII

Tabulating and Test-Scoring Machines: Applications of International Business Machines to Educational Research

IRVING LORGE

ANY REVIEW of the literature on applications of machine methods to tabulation, computation, and test scoring at the present time will be incomplete and inadequate. Many applications of machine methods have not yet been given formal publication. The present review will be limited to the machines developed by the International Business Machines Corporation and to applications of those machines to educational research. No single book covers the variety of machines available or the variety of applications possible. It is hoped that the long promised (since 1935) publication on "Questionnaires, Standard Codes, and Hollerith Machines" by H. A. Toops will be published soon.

The IBM machines include a large variety of punches, sorters, accounting machines, auxiliary machines, and special devices. The less well-known machines are the alphabetical interpreter, which prints punched information across a card; the collator which compares two sets of punched cards in order to match them or merge them; the duplicating summary punch; the gang summary punch; the automatic reproducing punch; and the automatic multiplying punch. Some special devices are the cross-footing device which makes possible computations such as $E \pm [(A \times B) + C + D]$; the card cycle total transfer device which enables speedier summation of cumulative sums; the card matching device for selection of specified profiles; the digit selector particularly useful for item analysis; the mark-sensing device which punches data into punch cards from pencil marks; and the test scoring device for grading questionnaires like the Strong Vocational Interest blanks. In addition, the IBM machines include the test scoring machine with its graphic item counter and the aggregate weighting device.

The machines, in general, make for greater speed in recording, classifying, and tabulating data, and in computing statistics. Because of great speed, the availability of data makes for greater statistical control of multivariate background data and extends the possibilities of research reporting.

General Books and Articles

The basic reference in the applications of punched card machines is Baehne (2), which includes chapters on the development and principles of Hollerith machines (Arkin), on applications to work of registrars'

offices, and to the work of university business offices, a cogent article on questionnaire construction and analysis (Toops), scoring of the Strong (Strong) and of Free Association tests (Kelley), the use of the multiplying punch (Carver), and the application of progressive digitizing to correlation, variance and covariance, least squares, and differencing (Brandt). The Baehne reference is an indispensable background for applications and procedures of the punched card machine.

As an adjunct to Baehne, the various manuals of the International Business Machines Corporation should be utilized (35, 36, 37, 39, 40). Hartkemeier (32) applied the machine to accounting but also illustrated the method of digitizing in obtaining correlation coefficients. Eckert (22) indicated the flexibility of the IBM equipment, particularly emphasizing the construction of tables, interpolation, and harmonic analysis. Jolliffe (42) briefly described the machines and their functions in educational research and statistical analyses. McPherson (53) referred to various mathematical operations with punched cards in table making, regressions equations, harmonic analysis, evaluation of determinants, and transformation of data, e.g., scaled scores for raw scores. Meacham (52) developed one of the few teaching texts for use of the machines, particularly in relation to vital statistics.

Carver (7) and Snedecor (72) described the uses of the machines in mathematical computations. Several books give applications to accounting (32, 69) and particularly to school accounting (43). Toops developed an annotated bibliography on tabulating and recording devices, including equipment other than the IBM (82).

Statistical Applications

Since the basic operation of the tabulator is the method of arriving at sums and cumulative sums, an understanding of the summation method of arriving at the values of ΣX , ΣX^2 , and so forth, is indispensable. Perhaps the earliest application of the summation method with digitizing was made by J. C. Dunlap (12). The earliest references to the use of punched card equipment for correlation and multiple correlation was made by Smith (71).

The digitizing method was popularized by several statisticians (5, 76, 87, 88). The summation method was rediscovered (62) and greatly extended by Dwyer (21), who summarized the theoretical background for the computation of moments with cumulative totals and cumulative multipliers. Mendenhall and Warren (58, 88) utilized the principle of cumulative sums and digitizing for getting correlation coefficients, giving credit to Leavens for the digitizing process (49). Dwyer (18) illustrated the power of the machines to compute the various statistics that are needed from data.

Dwyer and Meacham (20) demonstrated how to prepare correlation tables on the tabulator with digitizing by digit selection; Milliman (59) indicated how digitizing may be accomplished without sorting; J. W. Dunlap

(13) showed how the machine can compute means, standard deviations, and correlations with positive and negative numbers; DuBois (10) described how various statistical processes can be done on the card counting sorter; Kuder (46) revealed how correlations can be accomplished on the test scoring machine. Dwyer (19) and Meacham (57) employed the collator for pulling prepunched cards with data in form X , X^2 , XY , X^2Y , and so forth, to compute moments, product moments, and any tabled function.

Dwyer (17) pointed out that the Hollerith equipment is economical for five or more variables with cases in excess of 250. The Friden, Marchant, and fully automatic Monroe are more economical for four or less variables with cases up to 250.

McPherson (54) gave the background for the mechanical tabulation of polynomials for which the machines had been adapted (89). Sandomire (68) accumulated cubes directly from punched cards and Feinstein and Schwarzschild (26) used the machines for automatic integration of differential equations. Hartkemeier (33) showed how differences may be obtained from punched cards.

In the computation of item validity data, Tucker indicated how to quantify attributes (84a), Royer (66) demonstrated the steps for obtaining biserial correlations, which were somewhat extended by DuBois (11). Stalnaker (73) adapted the tabulating machine for computing difficulty and validity indexes; Flanagan (29) used Kelley's upper and lower 27 percent for getting estimates of biserial correlations and difficulty; Lindquist (50) obtained percents through cumulation of reciprocals for each item choice on a test, a technique also used by J. W. Dunlap (14) for getting basic data for estimating the value of tetrachoric correlation coefficients. Adkins (1) suggested applying the machine for Toope's *L*-Method of selecting items, and Flanagan (28) for approximating regression equations. The earliest use of the machines for regression equations was perhaps that of Segel (70).

Flanagan (27, 30) adapted Rulon's procedure for estimating reliability coefficients, and Stalnaker (74) noted the computation of Y values for integral values of X .

In factor analysis, Tucker worked out an approximate matrix multiplier (84), a method of getting Thurstone's centroid technique from punched cards (85) and graphs for the factor patterns (86).

Coding and Card Forms

The value of the punched card methods depends upon the classification and coding of the classifications adopted. Research workers will recognize that the coding-classification step is one of the more important elements in analysis. One of the most significant contributions to coding was made by Dunn (16) in his utilization of the geometric code for extending the capacity of a punched card. Toops and Royer extended coding concepts

greatly, particularly with reference to the uniqueness of the geometric code (65, 67, 78, 80, 81). Edwards (23) has shown how coding is a necessary antecedent to analysis of medical research data.

Berkson (4) developed an interesting punched card form for written and punched data. The punch operator punches directly from the written data which are always in view on the card being punched. Crissy and Flanagan (9) adapted the punched card for recording status with reference to deciles on various tests so that a profile can be developed.

Statistical Controls

Ever since Toops (77) indicated the need for statistical checks on data, the machine users have attempted to produce automatic or semiautomatic checks on calculations. One of the most significant contributions is that of Langmuir (48) on controlling errors in tabulation, card counts, and calculation. Brandt (6) indicated the effect of coding on calculations and their corrections.

Scoring Methods on Punch Card Machines

In psychology and education, scoring (particularly of multiweighted items) has been a laborious and time consuming process. Wood's method (91) for scoring the Strong blank has made work with it and tests like it more practical. Bedell (3) achieved somewhat the same result on the card counting sorter, and Rock (63) on the tabulator, particularly for developing item weights for such tests. Toops and his students (41, 79) developed the mask card in scoring multiple choice tests and in securing item analyses. Ross (64) also used the Hollerith for scoring tests.

Test Scoring Machine

The scoring machine implies an adaptation of the test item and the response sheet to the scoring machine (24, 44, 45, 47, 90). The items have to have a specific form and tend to be mostly of the recognition type. Very few investigators, however, have questioned the use of separate answer sheets as compared with direct response in the test booklet. McCullough and Flanagan (51) found the machine scoring form as valid as the booklet type. Traxler and Hilkert (83) noted that students who had plenty of room to take the test booklet with its answer sheet on a table did better than those who had to manipulate the booklet and answer sheet on arm chairs. This finding was statistically significant in only one of seven comparisons, but if proved generally it will imply separate norms for different conditions of administration. Dunlap (15) in an elaborate research has shown that the separate answer sheet does not affect reliability or validity of results.

Statewide and Other Applications

The possibility for accelerating scoring, reporting, and computing with the entire IBM equipment has been realized in many statewide testing

programs (38). Some of the many applications and adaptations have not been published. Illustrations of the flexibility of the equipment are given by Feder (25), McQuitty (55, 56), Mosier (60), and Stromberg (75). Cox utilized the equipment for research and student guidance, as do most of the testing installations.

Pinkus (35, 61) adapted the machine for high-school programming in a large urban high school, and Hall and Henderson (31) in evaluating the success of teams in judging cattle and crops.

With the impetus given to speedy test scoring, test reporting, and test analysis by the classification workers in the Army, Navy, and Marine Corps, new adaptations of the machines have been, and will continue to be, made. It is hoped that these applications and procedures will be published for the benefit of research workers in all fields.

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CHAPTER IX

Reporting, Summarizing, and Implementing Educational Research

DOUGLAS E. SCATES

How Should Research Findings Be Publicized?

How can the educational press help in making research effective in classroom practice?" This was the subject discussed by the Educational Press Association of America in its meeting in Atlantic City on February 25, 1941. One speaker, thinking primarily of survey research, fact-finding, and general evaluation, noted the great need for large scale cooperation on the part of field workers and the importance of group action in following up the survey to interpret findings and see that appropriate steps were taken to set the forces of improvement in motion. He urged a greater amount of publicity for such studies before, during, and after their prosecution. Another speaker, thinking primarily of "scientific" research—detailed experiments, laboratory work, the analysis of causal factors and mechanisms—noted the slow progress of scientific knowledge, the exploratory character of many investigations, the conflicting results of experiments, and the need for true scientific caution in accepting findings until they had been verified by many studies attacking the problem from a variety of approaches. He urged that due time be allowed between the reporting of a pioneer study and the adoption of practices in the classroom which devolved upon the new findings. Science has often been wrong. Much harm, both to children in the schools and to the esteem with which educational research is held, will inevitably follow upon the hasty acceptance of untested research findings.

There is apparently more than one type of educational research and more than one appropriate type of reporting. Certain undertakings undoubtedly need a broad base of social support; such are the studies which deal with problems that social action can handle. Certain other investigations need careful scientific scrutiny and testing over a period of years before they are ready to be thrust upon large groups with the admonition to accept them, for they are "scientifically proved." Such studies need to be reported in technical journals which will excite the interest of other workers competent to study them further. In due time they will be ready for inclusion in yearbooks, textbooks, and teachers' magazines. If science is not to mislead, it must be science—and not the results of some one or several studies made by workers having the same background of ideas. No finding is safe until it has been critically examined and tested by workers with diverse points of view. Our efforts to have research reported more widely and immediately should therefore be discriminating.

Need for Synthesis, Interpretation, and Evaluation of Research

It may be that there are certain deficiencies in the existing provisions for research investigations and reporting which retard progress both in practice and in theory. Reports of research findings need to go through a number of steps before they are ready for ultimate use. Our division of work in the United States may possibly be weak in some one or another of these points along the line. Possibly more facilities for reviewing, interpreting, synthesizing, and evaluating are needed. There is always danger that with various schools of thought and individual research centers pursuing their own special problems, no one will do the necessary work of synthesizing the various findings and weaving them into a "nonpartisan" whole which will have meaning and value for the consumer of research. In building our knowledge, the facts that add perspective are as important as the facts that add detail.

Such an integrating, evaluating task is entirely different from the direct dissemination of results of individual studies. We undoubtedly need, in education and psychology, more "research philosophers" who are not primarily engaged in producing research themselves but who will assemble, relate, and find both theoretical and practical meanings in the great mass of research which is completed every year. The conclusions of such interpreters would differ, but there is no reason for assuming that their work, based on existing research, would be any more in error than are many of the individual research studies. Such a process was one of the goals of Walter S. Monroe in preparing his *Encyclopedia of Educational Research* (52), when he urged each writer to tell, "What does the research to date add up to?" This function is discharged to a certain extent by the REVIEW OF EDUCATIONAL RESEARCH, though most contributors lean in the direction of being comprehensive and noncommittal rather than in the direction of interpreting, evaluating, and synthesizing.

Need for Direct Study of Applications

We also need persons who view research findings from a background that is charged somewhat more with the needs of the practitioner than with the abstractly technical and scientific considerations of the research producers. Such work can often be effectively accomplished by committees, if the persons with different backgrounds are willing to make some concessions to the criteria of those who have opposing frames of reference. At any rate, all must recognize that when research is to be applied, some of its "purity" must be given up—at least for the time. The attempt to apply will, however, lead to new problems demanding further study. Any application of science calls for a continuing adjustment between various factors, as one after another is modified or as general goals and purposes change.

We may, for example, note this sequence of study—application—study, in the case of radio. Although radio is based on the fundamental principles

of electromagnetic wave propagation set forth in mathematical terms by James Clerk Maxwell some seventy years ago, radio did not immediately spring into existence. Research on radio tubes is still under way, and it appears from the current full-page advertisements of the General Electric Company concerning its developments in electronics that a new area of possibilities has just been uncovered. And of course radio research must deal not only with tubes but with all aspects of radio—combinations of tubes, improvement of parts of the circuit, groupings of parts into new circuits, sound, adaptations to various purposes, market research, and so forth. It is probable that research on radio, both on the physical side and on the market side, will continue indefinitely. Even though radio as we think of it lies in the field of technology, the great number of problems which arise in the applications of the various scientific principles reveal countless lines for “pure” research to follow up—lines that would otherwise never be dreamed of. We would have no science of electronics if we had not first had the radio tube. Pure science, when it is alert, profits from applications as much as does the consumer. The same condition holds for research in education. The problems of application are as great as the problems of original discovery—and are in the long run as stimulating to “pure” research.

Occasionally just the change from small-scale to large-scale procedures will involve new difficulties. This condition is well illustrated in medical chemistry by the early work with insulin. After the hormone had been discovered, had been experimented with both in the laboratory and in the clinic with highly satisfactory results, its manufacture on a large scale was undertaken. The results “were at first extremely unsatisfactory and disappointing. Indeed, for some months (in 1922), although every stage of the laboratory process was apparently being duplicated step by step on the larger scale, it seemed impossible to obtain anything like the expected yield of insulin. It almost looked as if we had lost the secret of preparing insulin. Some unknown factor had evidently crept in, leading to the destruction of the hormone during its large scale extraction. . . . It was several months before the difficulties were gradually overcome. . . . It has since transpired that a chief cause for the difficulty depended on inadequate control of the degree of acidity at certain stages in the extractive process.”¹ The transfer of science from the laboratory to large-scale use may be expected always to have attendant problems requiring further study and research.

Examples of Research Summarization, Synthesis, and Interpretation

The joint yearbook of the Research Association and the Department of Classroom Teachers (3) is a recent illustration of the summarization

¹ J. J. R. Macleod. “Insulin to the Rescue of the Diabetic” In *Chemistry in Medicine*, Julius Suehltz, ed. New York: The Chemical Foundation, Inc., 1928. p. 304-305.

and interpretation of research findings for direct classroom use. It is the current counterpart of the Eighteenth Yearbook of the National Society for the Study of Education, Part II, presenting the Fourth Report of the Committee on Economy of Time in Education, issued in 1919. Such reports are pointed toward the practitioner.

The *Encyclopedia of Educational Research* (52) was an effort to present "comprehensive and critical syntheses of the results of educational research organized in a conveniently usable form. . . . It is the purpose to tell what the findings of research 'add up to' after critical evaluation and what this synthesis of findings means relative to educational theory and practice" (p. vii). The *Encyclopedia* stands about midway between the original research reports and the interests of the ultimate consumer of research. It is of service to both groups of users.

In the general category of interpretative summaries of research should be mentioned the five-volume report now being published by the Progressive Education Association (64) covering the Eight-Year Study of high-school and college articulation, and the final volume of the American Youth Commission (6) summing up their several years of study. Other aspects of interpretation, involved directly in implementation, will be discussed toward the close of the chapter.

The 1938 Contributor's Manual for the REVIEW OF EDUCATIONAL RESEARCH states that "The REVIEW is to be factual, evaluative, and suggestive." A chapter should include "A summary description of the methods, . . . setting or background, placing the research properly in its field, . . . critical evaluation indicating weaknesses and strengths, . . . a general overview of the field indicating the contribution of the research to practical problems and to a developing generalization." The 1942 edition states: "The purpose of the REVIEW OF EDUCATIONAL RESEARCH is to review—summarize, synthesize, interpret, and evaluate—current research in education." As indicated previously, many contributors to the REVIEW lean more toward a catalog of current research than a synthesis. The significance of research for practice is seldom pointed out; probably the REVIEW is too close to the original reports for this to be an appropriate step. The REVIEW is of primary service to students or others about to undertake a piece of research in a field that is somewhat new to them, and to those who wish to keep abreast of research activities in a variety of fields in education.

It will be noted from looking over interpretative syntheses that they almost necessarily involve going beyond the data and drawing more general or more particular conclusions than the facts will entirely support. The more the summaries attempt to interpret research for practice, and the further away they get from the original reports, the more this is true. Such a step is not to be shunned. It is one phase of "applied science"—technology. Science itself deals usually with single, narrow aspects of phenomena; the practitioner needs to consider all the aspects of the situation in which he is working. Such practical interpretations of research

are, therefore, to be regarded as approximations and, perhaps, as starting points for further study, when the results in the field do not approximate those obtained in the more theoretical work. By way of analogy, it is easy for physicians to destroy viruses in the laboratory, but they have practically given up the attempt to stop or control a cold in one's head through the use of antiseptics. "In this case general therapy is more effective than local therapy," one is likely to be told. All syntheses of theoretical findings must be regarded as highly tentative for practice; the application usually involves difficulties which require that the theoretical conclusions be restudied in the light of practical factors.

Overviews and Compilations; Bibliographical Summarization

There are a number of summaries which present overviews of certain research areas or periods, usually with some interpretation but without a definite attempt to synthesize into a general theory or point of view the findings of the research reviewed. Outstanding among these are the annual reviews of large research undertakings and implementing projects by Good (32) which have been published for the past five years. Good also prepared a somewhat longer résumé and orienting discussion (33). Scates (76) prepared a brief overview of research for the past decade. Carr has prepared the seventh listing of Deliberative Committee Reports (20); references to the earlier annual compilations are included. These lists are annotated and help give an annual picture of the findings and decisions of various committees that are working with educational problems.

If we include those publications which merely select, classify, and make more available the original articles, we should mention such periodicals as *Education Abstracts*, *Education Digest*, and the *Loyola Educational Digest*. There is also the work of the National Education Association Research Service in publishing *Education in Lay Magazines*. This periodical was recently analyzed for a ten-year period by Hughes (43). A section of the *Journal of Educational Research*, "Research News and Communications," edited by C. V. Good, is given over each month to the publishing of news notes about current research activities. Purely bibliographical services were treated in Chapter I of the present REVIEW.

Procedures and Criteria for Preparing Technical Reports

This section deals with the more immediate or detailed aspects of reports. Treatises on the preparation of research reports before 1936 were covered by Good, Barr, and Scates (35: Chapter 13) with 126 references, and by Culver (26) with 62 references. Whitney's 1937 text or his revised edition (90: Chapter 16) includes about 50 references. Nine more or less brief treatments on the preparation of theses or undergraduate research papers are: (19, 23a, 24, 34, 36, 44, 61, 86, 94). Several papers on desirable forms in which to report statistical facts to businessmen, news reporters, and other consumers (11, 29, 45, 96) grew out of a program of the American Statistical Association on this subject. One may wish to

consult publications on the preparation of research reports in engineering (8, 42) and in chemistry (56, 69).

Various forms of citation for use in educational work are included in the educational treatises of the preceding paragraph. Forms of citation for psychological publications were discussed in three places (30, 46a, 83). A revised edition of the *Government Style Manual* (87) has appeared. The University of Chicago *Manual of Style* (23) has gone thru its tenth edition. Manuals for contributors to the REVIEW OF EDUCATIONAL RESEARCH were issued in mimeographed form in 1938 and in 1942. Other publishers have prepared form books and manuals for their own authors. For current listings see the head, "Stylebooks (printing)" in the *Education Index*.

Segel, in Chapter III of this issue, notes the need for specifying conditions and units of enumeration; and Blommers and Lindquist, in the closing section of Chapter IV, mention the need for clearer and more adequate descriptions of the technical aspects of what was done, in reporting any investigation.

Popularized reports and graphing are discussed in later sections. For current references on reporting, one may see the head "Reports: Preparation" in the card catalog of a library; Good's "Selective Bibliography on the Methodology of Educational, Psychological, and Social Research," Section III—usually in the September issue of the *Journal of Educational Research*; and "Research, Educational: Techniques" in the U. S. Office of Education annual *Bibliography of Research Studies in Education*.

Evaluation of Reporting Mediums; Problems of Publishing

Various statistical attempts have been made to estimate the service which a particular magazine is rendering. Circulation is one basis for estimating service and appeal. The number of persons who read each magazine is a second index (35:126-30). The number of times articles in a magazine are cited in articles appearing in other professional magazines is a third form of evidence concerning worth. Direct judgments or evaluations constitute a fourth method. An analysis of the third type was made of several psychological periodicals some time ago by Cason and Lubotsky (21) and has been done more recently for educational periodicals by Wilkins and Anderson (91, 92, 93). As is the case in all evaluations based on frequency studies, considerable care must be exercised in drawing conclusions. Similarity or commonness of interest and purpose between the periodicals cited and those doing the citing and between the citing periodicals and the reader must be assumed before such frequency counts have significance either in general or for the prospective reader or subscriber. Steele (81) prepared a rating scale for book reviews and applied it to certain journals.

Publication lag was discussed in two places (66, 67) in psychological magazines and was discussed in educational magazines by Donohue (28). Microphotography or microprint as a method of publishing research was treated in Chapter I.

Dull vs. Appealing Reports of Activities

In recent years there has been something of a revolution in the public reports of the activities and statuses of school system and corporations. If reports are worth making, they are worth reading; if they are to be read, they must have widespread appeal. So superintendents, business managers, municipal governors, and industrial corporations have concluded that if their reports to the public or to stockholders are dull or not instantly comprehensible, it is the fault of the persons who get the report out, for reports can be glamorous! Accordingly, many reports have been made much more appealing, usually thru the use of more photographic or other graphic material, and through the decrease of tables and routine records of departmental work. The older reports were commonly couched in technical or semitechnical terms and involved matters of far more concern to the persons in charge than to the common reader.

While we are not here intimately concerned with superintendents' reports, inasmuch as they cover activities and seldom deal with research, we may nevertheless have occasion to consider some of the methods they have employed. There are times when research could well afford to stimulate the fancy and interest of lay people in its endeavors, its problems, and the ingenuity and patience of its workers, even though it makes no effort to acquaint people with its detailed findings. Numerous current popular reports of medicine and physical science do a great deal to keep these fields in high esteem in the public mind. Educational research, like school administration, is in need of taking time occasionally to glorify its work and share with others the hopes that impel its workers forward in their long, monotonous tasks and the difficulties and discouragements that often beset the explorer seeking something which, even after years of effort, he is not sure is there.

The changed character and purpose of many superintendents' and business managers' reports were reviewed at some length and with considerable clarity by Theisen (84). Arnold and Castetter (7) mentioned three more articles. Educational Research Service prepared a bibliography (2) on superintendents' reports. We shall make reference here only to six articles commenting on the character and preparation of such reports (10, 16, 27, 46, 62, 72).

It seems appropriate to mention as examples four recent school reports which are conspicuous among those which are highly pictorial: (a) The Springfield, Missouri, 1938 report (80) carried about 60 percent pictures and no tables, and was published "to give you as taxpayers some notion of our conception of the meaning of democracy and its importance, and some idea as to the school's responsibility for and contribution to preserving and making democracy work better." (b) The Rochester, New York, 1943 budget (71) carries six pages of pictures, captions, and paragraphs at the outset, and the budget is presented in

the remaining twelve pages with a moderate amount of text and about 20 percent pictures. Graphs are pictorialized in various ways. The Rochester budget for some years has been an inspiring publication. Its present character took form in 1936; its earlier popular form dates back to 1927. (c) The Fostoria, Ohio, report for 1941 (31) carried about 90 percent pictures. Three pages were "thermometers," showing the ratings of the schools on eighteen aspects according to the Cooperative Study of Secondary School Standards. It is interesting as a report of a relatively small city. (d) The Chicago report for 1941 (22) was profusely illustrated (about 30 percent of space) thru some 500 pages, followed by about fifty pages of tables. (The report covers the years 1936-41.) It was organized around activities in the school curriculum which were of immediate interest to parents and the general public. (e) In addition to these reports for individual cities we should mention a popular report of the U. S. Office of Education (88) which utilized pictorial and diagrammatic material to portray its manifold activities. There was no separate text.

As treatises on the preparation of reports in business and city government, five references will be cited (8, 70, 75, 77, 78). Other references may be found in the card catalog of libraries under "Reports: Preparation" or "School Reports"; in the *Education Index* under "Reports and Records"; and in the U. S. Office of Education annual *Bibliography of Research Studies in Education* under "School Management: Reports and Records."

Visualized Presentations of Research Findings

While the reports of activity and status referred to in the preceding section relied largely upon photographs, because of their appeal and portrayal value, reports presenting research results, survey findings, and summarized data have made more use of one form or another of graphs. Thus the Regents' Inquiry of New York State summarized the results of "fifteen printed volumes and many typewritten and mimeographed reports" in a 46-page *Primer* (39), consisting of one or two sentences of text on each page with a pictograph occupying the rest of the space. In the same year the New York State Education Department published a bulletin (60), consisting of thirty-six full-page pictographs with a short paragraph of text accompanying each, to present a brief history of the schools of the state and their problems. The American Youth Commission's *Youth Tell Their Story* (9) contained sixty-two charts and pictographs—one diagram for every $3\frac{1}{2}$ pages of text—in addition to ninety-nine tables. Shuttleworth's presentation of factual material on growth during adolescence (79) depended wholly on graphs and pictures, with accompanying paragraphs of explanation; there was no separate text. Goodykoontz departed from the traditional style of the U. S. Office of Education summary bulletins (37) by omitting ordinary tables and diagrams and introducing a number of pictorialized graphs.

Other Visualized Factual Material for the Nontechnical Consumer

We shall refer here briefly to several other publications which are good examples of the technique of presentation being discussed. The War Department innovation in a textbook (89) which is devoid of text apart from brief comments on the graphs is interesting both because of its subjectmatter and its form. A graphic history of the United States (40) has about one-third of its space given over to an ingenious variety of pictographs. The magazine *Building America*, published by the Americana Corporation for the Society for Curriculum Study and now in its eighth volume, gives roughly 40 percent of its space to text and 60 percent to pictures and graphs. The set of pamphlets published each year by the Travelers Insurance Company (Hartford, Connecticut) on automobile accidents, for free distribution to schools, and the annual publication *Accident Facts* (55) are excellent examples of how simple, "dry" statistics can be made most attractive. Hoban, Hoban, and Zisman (41: 198-207) not only discussed visualized textbooks but prepared a treatise on visual materials for classroom use which may itself be cited as an example of visualized text. The Public Affairs Pamphlets (distributed to schools by Silver Burdett) and the Headline Books of the Foreign Policy Association are active series which make extensive use of pictographs.

Neurath's semipopular treatise on modern man (59) included many pictorial diagrams which he states "do not merely act as illustrations or as eye-bait; they are parts of the explanations themselves" (p. 7). As other examples of books in which the visual material is integrated with the text and forms a part of the continuity, instead of serving merely as exhibits, we may mention two books by Caldwell and Bourke-White (17, 18) which represent photographic and verbal reporting of American life. A publisher's blurb states: "Two creative artists have developed and mastered an original and brilliant pattern of book-making. The face of a nation has never before been recorded so richly as here."

An Outstanding Graphic Development: Pictographs

One cannot read the references in the two foregoing sections without realizing that a new type of graph has come to occupy a leading position among graphs designed for popular consumption. This newcomer is the pictograph. It not only does an admirable job of presenting comparative quantities but, in the capable hands of its leading exponents, it has been adapted to clarifying and presenting complex relationships, including cause and effect and story sequences. In spite of doubts and inhospitality which have been prevalent among technical workers during the past two decades, this type of graph has swept into indisputable dominance of the graphic field wherever relatively popular reports of a few quantities are involved.

The pictograph is essentially a series of suggestive symbols repeated to form pictorial bars. There are other developments of pictograph, in the

realm of maps and sequences, which involve primarily simplification and suggestion. The pictograph is not appropriate where curves are called for; but frequently the popular graph can, and should, be simplified to the point where a few values will suffice in place of the larger number of observations giving rise to a smooth curve. At a meeting of the American Statistical Association in Chicago (December 28, 1940) devoted to "Principles and Procedures for Putting Across Business-Statistics Reports to Executives," several speakers and other commentators expressed dislike and disdain for the pictograph. It was regarded as a highly complicated and frilled device which commonly ends in fractions of a symbol and generally distracts one's attention from the main point. Brinton (12: 12-13), in his preface, implies that it was developed in countries where the people had a low level of literacy and is something of a "weed" in America. It seems probable that the professional statistician, thinking only of a technical or intrinsically interested reader, will view such graphs differently from what the general reader will. Pictographs, where they are well designed, catch one's attention, getting many a reader to pause long enough to look at the graph. They hold the attention on each bar, or category, longer than a simple printed label would, thus giving time for more comprehension. They add an emotional element of interest, enjoyment, and satisfaction to the bare facts which are presented. And, again when they are well done, they represent a careful analysis of the problem and a simplification to the most important aspects so that the main points stand out clearly—which is just what a graph should do. If they go further in this direction than the highly trained statistician would go, perhaps the statistician needs more training along the line of how the common person thinks.

The pictograph was developed in a social science museum in Vienna during the early 'twenties, principally under the sponsorship of Otto Neurath, with Rudolf Modley as a member of the staff. While earlier isolated instances of this type of graph were produced or quoted in several textbooks (1; 12: 122-24; 73; 74), in the United States nothing was done to exploit its possibilities. Modley came to America in 1939, joining the staff of the Chicago Museum of Science and Industry. In 1934 he helped found, and became executive director of Pictorial Statistics. This agency, which renders a commercial service to schools, authors, and publishers, has lately used the name of Pictograph Corporation because its work has extended to include nonstatistical graphing. Neurath left Vienna in 1934 and helped establish the International Foundation for Visual Education at The Hague, Holland. He is now at Oxford, England.

The movement which developed the pictograph has involved far more than just drawing graphs; it has embodied the searching for social facts and relations which are of importance to present. It has led to social museums, foundations, and a great increase of interest in social statistics. The history of the movement to 1937 was presented by Modley (47: Chapter 13).

Examples of pictographs are far too numerous to mention here. Many of the reports cited in previous sections employ them (9, 39, 40, 59, 60, 89, and others). Modley (47: 158-66) gives an extensive bibliography for publications in Europe and in the United States to 1937.

Treatises on the Production and Use of Pictographs and Other Graphs

The principal discussion of pictographs and methods of making them is by Modley (47) in 1937, a work which is now being revised. His best brief discussion of types of pictograph to portray various facts (51) is probably not widely available. Other discussions, however, serve to round out the picture (41: 242-47, 48, 49, 50, 95). Three of these references (41, 48, 50) deal particularly with the use of pictographs and other charts for teaching purposes in the classroom. A catalog of *1000 Pictorial Symbols* (63) has been published illustrating pictograph symbols which are available for use by others (cost, 5 cents each, to schools). Two small books by Neurath (57, 58) discuss the use of pictographs for an international symbolic language.

A point that is likely to be overlooked by the novice and omitted in the treatises is that the success of a pictograph depends upon something more than clever symbols. The production of a good graph involves, first, an analysis of the principal facts or elements of the story to be represented; second, the selection of the appropriate type of graph; third, judgment as to proportion, titles, legends, and so forth, so that the final product is a graph that is simple, clear, bold, engaging, and accurate in the impression it conveys. A successful graph depends far more on careful thought and judgment than on technique.

This section is not concerned with graphing in general but only with graphs which are particularly important in the reporting of research and summarized facts. In this connection we note two publications of basic importance (4, 5) by committees of the American Society of Mechanical Engineers. These reports (one of which is in press at the present writing) represent a long-delayed answer to hopes which were engendered some twenty-eight years ago when a committee was set up to produce standards for graphic presentation. The preliminary report, published in August 1915, was reproduced in many textbooks, but was generally regarded as something of a makeshift. It is therefore a great satisfaction to have extensive, detailed, and authoritative reports covering two large groups of graphs—time-series charts, and engineering and scientific graphs. Brinton's pioneer treatise on graphic methods (in 1914) has been superseded by a revised edition (12) which, though it lacks the adequate textual setting of the earlier volume, presents a great variety of graphic possibilities. One further reference (68) may be of interest since it reveals statistical graphs from the point of view of a cartographer. Other treatises will be found by consulting the head "Graphic Methods" in the card catalog of a library or in the *Education Index*.

Implementing Programs and Publications

A brief note on implementation will close this chapter on reporting and also finish this research volume which was appropriately begun with a discussion of library procedures. Getting research into practice completes the research cycle—and also begins a new one, for further research will have to be done on how well a device or procedure works in practice and how to improve its functioning in practice.

According to the new *Webster's Dictionary of Synonyms*, published this fall, the verb "implement" "has seen rapid development in its implications . . . especially since early in the third decade of the twentieth century"—which was about the time it greeted our ears on every hand in educational conventions and deliberative committee meetings. The word "usually" suggests reference to . . . proposals or projects which have been accepted, policies which have been adopted, and the like, and implies the performance of acts that definitely carry them into effect or ensure their being put into operation."

In a sense, every educational organization in the country is engaged in implementing its program, and so far as this deals with educational research, it is deserving of recognition here. We must therefore content ourselves by referring to a few outstanding examples of what is going on somewhat widely. The Implementation Commission of the National Association of Secondary-School Principals has been at work for several years, stimulating publications which help translate general principles into terms of definite school action. The Discussion Group Project, begun in 1937, is another outcome of the work of this Commission. The Cooperative Study in General Education and the Commission on Teacher Education, both of the American Council on Education, and the Stanford Social Education Investigation are other examples of implementing work—concerned with carrying significant facts and research findings to the cooperating institutions and developing applications.

The Progressive Education Association Commission on the Secondary School Curriculum published, through various subjectmatter committees, a number of implementing treatises. Reference to one of these volumes will serve as an example. The treatise on science (65) not only details the general program but contains a chapter on "How the Teacher May Make Use of the Report" and gives several extended illustrations of science units. Reports of the National Committee on Science Teaching of the American Council of Science Teachers helped further to implement general policies in this same area. A recent series of publications by the U. S. Office of Education represent an implementation of our general policy of teaching democracy and the fundamental issues of the war in the public schools. The new series of pamphlets on problems in American life (54) is instructional material to implement a belief that contemporary problems should be taught in the high school. The joint yearbook of the American Educational Research Association and the Department of Classroom

Teachers (3)* is an example of attempting to implement all educational research which bears directly on teaching. Further details and other examples of implementation will be found in the general summaries of research activities by Carr (20), Good (32, 33), and Scates (76), cited earlier, and in Good's section, "Research News and Communications," appearing monthly in the *Journal of Educational Research*. A committee of the American Council on Education outlined implementing practices and principles (2a, 38a).

Summary Statement

A number of writers have commented on the general relation of research and classroom practice (3, 13, 14, 15, 25, 38, 53, 82, 85). Some are impatient that research findings are not more quickly and more generally introduced into the classroom. Some think the difficulty lies in inadequate and improper reporting of research. The basic attitude seems to be, "What is worth knowing is worth putting into practice." The difficulty is that we do not know something as quickly as we are likely to think we do. What the teacher or administrator may regard as proved beyond question, the more cautious research worker may regard as only in the beginning stages of exploration. It is certain that we shall do both research and educational practice an injury if we take the attitude that the findings of every study should at once be made available for putting into practice. Much of our research is for science rather than for practice, and all research needs mellowing. The best course for getting research into practice is not through more widespread and direct reporting of findings to teachers and administrators but rather thru more deliberative and implementing committees which will carefully weigh results in a broad field of study, synthesize the findings into consistent theories, express principles in concrete terms, adapt generalizations to local conditions, try out recommendations, and then offer conclusions for general action by workers in the schools. Local committees of teachers and administrators who have some research perspective and who understand that the applications of "raw" findings involve further study and research, can often help in the process, especially when they work in cooperation with a university professor who understands both research and teaching. Such procedures take time, yes, but they represent the only safe course for both the schools and research.

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¹ Corrected to January 1, 1943. Errors should be reported to the Secretary-Treasurer immediately.

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